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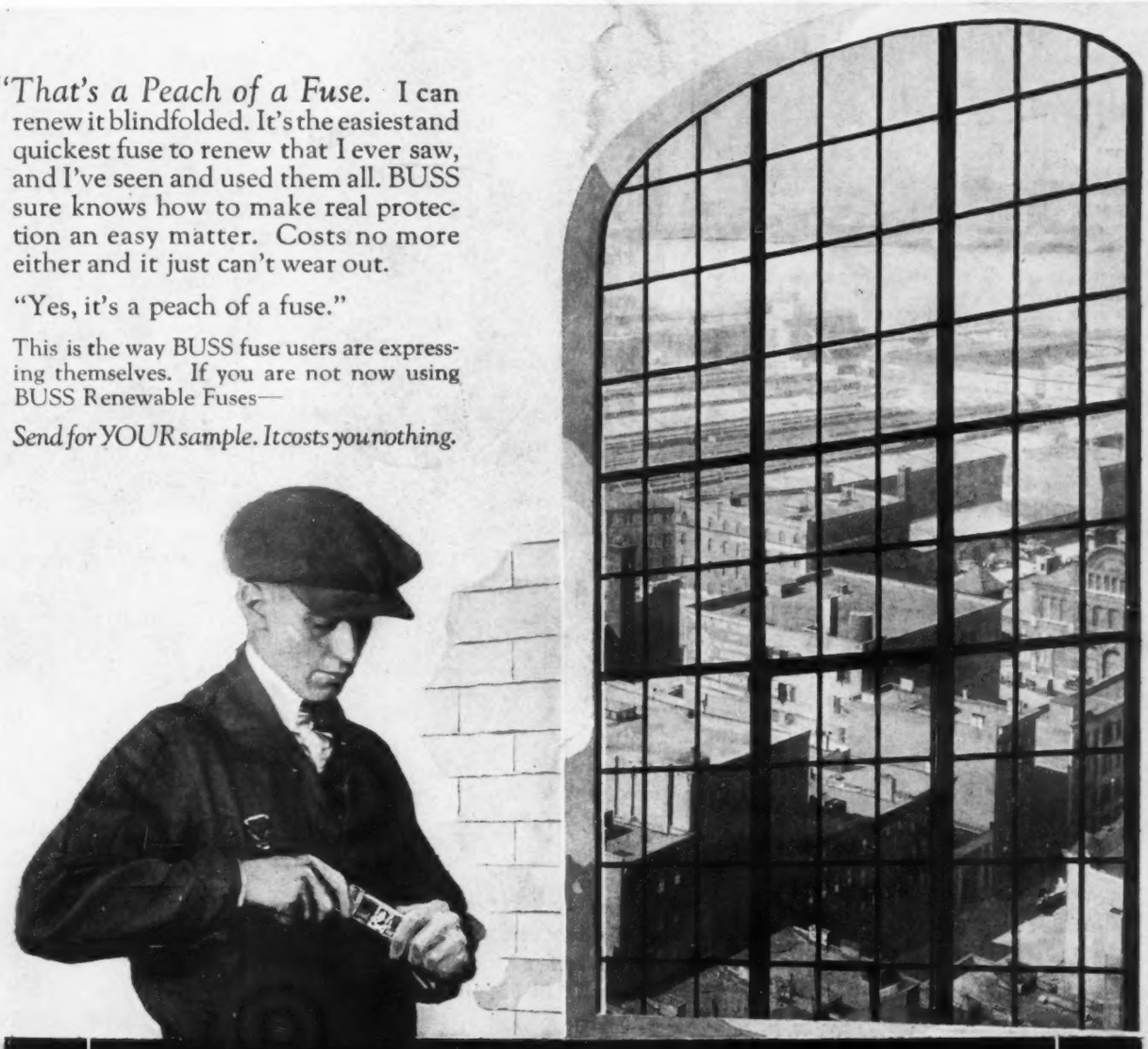

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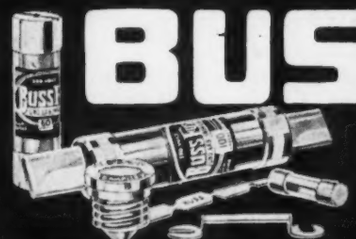

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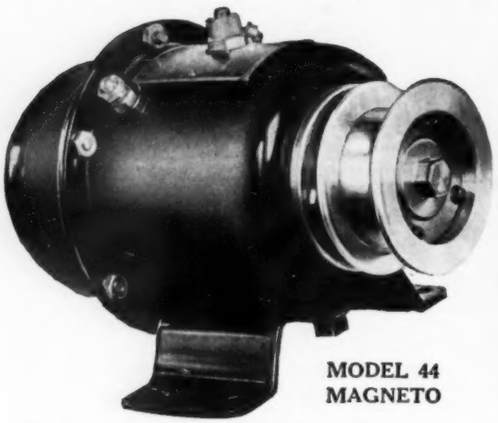

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Electrical World

Published by McGraw-Hill Company, Inc.
W. H. ONKEN, JR.
Editor

VOLUME 86 — *New York, Saturday, August 29, 1925* — NUMBER 9

A Lesson from Commission Rate Decisions

THE decisions of public service commissions when they order reductions in rates and charge, as some have recently done, that excessive amounts have been spent in selling and advertising are significant. Without regard to the facts in any particular case, there is a principle involved that should be self-evident to every executive: If the sales department of an electric light and power company is making money, no commission can curb its activities or suggest any restriction in the advertising that it does, either to sell merchandise or service or to build good will.

The power company that has developed a large volume of business in the sale of domestic, commercial and industrial appliances on a clean-cut merchandising basis paying a profit adequate to carry the cost of the entire sales department work is in a position of independence. It is paying its way in its market-building enterprise, without throwing any burden on the cost of service or involving any question of rates. The company's responsibility to the public is to provide electric service at the lowest fair price. If in addition it engages in the business of developing the popularity of energy-consuming appliances and selling them and makes this market-building enterprise self-supporting, no commission can claim that this is contrary to the public interest.

There are many electric light and power companies in the country today whose sales departments pay a profit to the stockholders. There are many more companies where the cost of selling is a charge against the earnings from energy sales. But the day will come when it will be an accepted standard that the sales department of such a public utility should be a business enterprise that pays its way and is entitled to enjoy its profits.

Is Electric Heating a Trade Secret?

MUCH as has been said anent the need for more data covering the applications of industrial electric heating, there still exists a reluctance on the part of heating engineers, apparatus manufacturers and some users to give out the facts concerning successful installations. Absence of data on the fuel-heated equipment formerly used makes comparison with the newer electrical process difficult. However, this does not appear to be the biggest stumbling block in the way of more rapid progress in the application of electric heating.

There is a tendency on the part of many heating engineers to throw a cloak of mystery about the methods used and results obtained with industrial electric heating. When selling apparatus to the user the impression is created that a special secret process has been evolved for his sole purpose. True, most sizable electric heating jobs require special treatment and apparatus, but after the installation has been made the user is more inclined to tell about the improvements he has effected than is the engineer or manufacturer who designed and built the equipment.

Electric heating not only offers the electric light and power industry a large and desirable load, but the sale of utilization equipment means much more in actual dollars and cents to the engineer and manufacturer. Specialists who withhold data or harbor the belief that they possess certain trade secrets hamper the growth of the business by creating doubt of the merits of a process about which there appears such a dearth of accurate information. Possibly the propaganda of the gas association may cause manufacturers of electric heating apparatus to see the light.

Handling Concentrations of Power on Interconnections

WITH the development of extra-high-tension transmission and interconnected power zones, the problem of the heavy duty on oil breakers resulting from the concentration of power—a difficulty which has so far pretty well resisted the efforts of designers and of operating engineers—is likely to become more and more serious. The use of current-limiting reactors, which has greatly ameliorated a similar situation in large power stations and with underground feeders, is hardly appropriate in overhead circuits of extra high tension, such, for example, as 220 kv.

In a superpower zone there is an opportunity, however, to avoid this critical concentration, made possible by the fact that the load is more or less widely distributed at various load centers and that there are a number of separated sources of power. When, in accordance with the more usual present practice, these power stations are all connected to one or more main substations, acting as a clearing house, power being fed therefrom by radial lines, a tremendous concentration of power occurs at these main substations, not only putting an excessive duty on the oil breakers but causing any breakdown at this point to be severely felt all over the system. If, on the other hand, following the model of many direct-current distributions in large cities, the power be distributed by separately located lines radiating from the generating stations more or less directly to the various load centers and intersecting at frequent intervals, the clearing-house function is performed just as effectively and concentration of power is largely avoided.

In such a network it is essential that the links of line between intersections should not be of too great length. The points of intersection of the high-tension lines would naturally usually be at load centers. To carry the idea of this type of network to its limit, single-circuit lines would be used throughout. This

would hardly be feasible in most cases on account of existing construction. The short-circuit current at any point in such a network would be limited to the amount that could flow through the two or three circuits connected to that particular point; that is, these line links next to the fault would act as current-limiting reactors. The same limitation of short-circuit current flow greatly minimizes the disturbance caused in the rest of the system by the "short." The importance of such limitation can hardly be overstated.

This type of network cannot be discussed at length here, but it may be said that while this method of approaching the problem of limiting the concentration of power is available only where material transmission distances are involved and where the load centers are somewhat scattered, there are already a number of regions where the magnitude and complexity of systems have grown to the point where it may well be considered.

Modern Street Lighting and the Traveler

TIME was, as men far from old can well remember, when a traveler on business or pleasure reaching at nightfall a city strange to him had the alternative of spending a tiresome evening in his hotel or taking pot luck at a local theater. To stroll through dimly lighted streets or attempt to view by gaslight or primitive electric arcs whatever of interest the city might contain was an uninviting and, if pitfalls or pickpockets abounded, even a slightly hazardous occupation.

Modern street illumination has, like Molière's practitioner, changed all that. With a very few exceptions which are rapidly ceasing to be such, there are no large or medium-sized cities in the United States where street strolling, in the business districts at least, has not become more pleasant by night than by day. The crowding of fellow pedestrians is less, yet the deserted sidewalks of old no longer induce a feeling of loneliness; the trucks and business vehicles have withdrawn from the thoroughfares, reducing noise, delay and risk; many stores remain open and all have brilliantly lighted window displays that tempt the passer-by to linger. Overhead shine powerful and handsomely mounted lamps, and above and below them flash myriads of signs. Lofty domes and façades of architectural merit are outlined by electric bulbs or thrown into harmonious relief by floodlighting, the newest element in city beautification. On the other hand, the dirt and the rubbish, the mean and tumbledown structures enduring from former days, all the shabby spots that stand out in the sunlight like scars, become inconspicuous or even invisible and no longer spoil the picture. The tourist stopping over to break his journey and see the town views it at its best and saves his time.

In relative degree the same thing is true of thousands of small cities and country towns all over the land. Main Street in evening dress differs from Main Street in the daytime much as the village belle arrayed for the ball differs from the village belle in her morning wrapper. Jenkins Corners dons fairy robes; a worthy civic pride is stimulated; passengers on the railroad as they whirl through or stop for a moment or two at the station glimpse the illumination and the welcoming signs and place the enterprising town upon their mental maps. Thus Jenkins Corners is advertised as well as decorated. Once more the beautiful proves "as useful as the useful—perhaps more so." For the transformation the traveler who remembers former days has every reason to be grateful. It is not the least of electricity's miracles.

Explain Real Purpose of Seeking Friendship

TOO much emphasis on how friendly utilities wish to be with the public and what they are doing for the public is liable to create exactly the opposite impression from that desired. The public may suspect some ulterior motive, believing that nothing is ever done by any business organization for unselfish reasons alone. If the educational type of public relations activities is to be continued, it would be advisable to state frankly at the outset and to emphasize in different ways periodically that experience has proved that no individual or company can expect to prosper unless he or it has the confidence and friendly feeling of those with whom business is conducted; that the policies and practices of the utility company have therefore been established to make it pleasant and convenient for the public to do business with it; that the presentation of information is made to let the public know the utility has nothing to hide and to avoid misunderstandings; above all, that business is more interesting when it can be conducted with friendly relations. A frank avowal of this kind will create real respect for the highly laudable practices of utilities which are sincere in their efforts.

Savings in Distribution from Interconnected Circuits

NOT the least of the benefits of the interconnection of adjacent utilities into zones is the facility which it offers for the distribution of power in local systems. At first thought the advantage of such an interconnection is taken to be the acquisition of additional cheap power or of emergency power on an old system; but interconnection may also offer great opportunities for economy in connection with distribution. When power is brought into a system, especially if it comes from more than one direction, it is feasible to establish new centers of distribution by step-down transformers anywhere along the new routes if a load exists. Lines from these centers will shorten greatly the original distribution distances. If by intelligent choice these new supply points are estabished at preexisting substations remote from the original power station, the new step-down transformer may take over the load at this substation and at the same time permit the latter to serve as a new source for feeding adjacent substations over old lines. This relieves other old lines and enables them to take up additional load.

If this opportunity is neglected, a utility may find itself transmitting high-tension power past an important load only to bring it back a long distance over distribution lines at low voltage. Again, by establishing a number of step-down points in the load areas traversed by the interconnecting lines or reached by auxiliary extensions thereof, the average distance of distribution may be reduced. When it is remembered that the cost of distribution may exceed the cost of transmission, it will be seen that this feature of inter-

connection becomes important. No generalization can be made as to the amount to be gained in individual cases by using interconnecting lines to facilitate local distribution of power, because physical conditions vary, but in favorable cases appreciable savings may be made which will increase with the subsequent growth of the system.

The Advantages of Operating at a Standard Frequency

PRIOR to interconnection the question of operating at standard frequency was of minor importance. System operation at one cycle high or low was considered close enough for conditions then prevailing, and the frequency instruments then developed allowed for little better regulation. As central-station industrial loads increased and manufacturing processes—as in textiles—became more refined, the demand for a better average speed became more insistent, and with this demand came better instruments. Still there was little real complaint against speed variations as long as these were not too great or too sudden. With the growth of power companies the number of plants per system increased, but frequency control was about as simple in intracompany connections as with the single plant.

With the advent of intercompany tie lines a new element entered into the situation. Many interconnections were established between steam and hydro-electric plants, the primary objects being to sell surplus water power during times of high water and to buy steam power in low-water periods. The importance of the frequency problem increased, especially to those companies which were maintaining a good average speed and which desired to keep their reputations in this respect high, and, if possible, to improve them. On the other hand, some hydro-electric companies felt that there was a considerable advantage to them in being able at times to disregard frequency to the extent of say one-half to one cycle. By doing this they could assign a given load in advance to each plant, throwing the variations upon the steam generating units. As interconnections have developed, however, the question of operating between narrow limits of frequency has assumed a more pressing importance than ever before. In the old days, with the smaller capacities, it was possible to phase in machines or plants even if the frequencies were a little off, as the units would fall into step quite easily. With the great plant capacities now interconnected in many cases over relatively small capacity lines, it is less easy to fall into step, and in fact there have been numerous cases in the past year when tie switches have immediately opened or loads have been dropped in trying to put systems together. Sometimes one or two hours has been required to bring the systems close enough together to couple them safely, and under emergencies this is a serious condition.

Where apparatus is purchased, for example, on the basis of 60-cycle operation, running on a higher frequency cuts down the safety margin, especially on steam turbines. Where a turbine is operated normally at 1,800 r.p.m. with an overspeed trip at about 1,940 revolutions, a speeding up of half a cycle reduces the margin of safety more than some conservative operators care to do.

Another important result of the variation in frequency is the large accidental exchange of power between companies. To avoid this many companies "cut away" when there is no demand for power, but this defeats one of the chief advantages of interconnection—the emergency reserve. Other companies stand the accidental exchange for the sake of the additional safety. With the increased demand for economy, safety and capacity, it will be but a short time when all must stay connected to the general system.

That those in charge of operating the various systems realize this is shown by their changing attitude on the subject. They are discussing it more and more and stressing the importance of closer regulation. They are not all in accord as to the methods to use to obtain it or the limits to allow, but they are all getting a clearer conception of the importance of setting much narrower limits of variations from standard. With this knowledge of the importance of the problem is coming the closer co-operation necessary for its satisfactory solution; and, as has always been the case in the electrical industry, with the demand for closer regulation has come the development of instruments to make such regulation possible.

Utility Companies as Consultants on Electric Traffic Signals

THE net revenue from electric traffic signals, when owned by a city and operated and maintained by the local utility company, is not inconsequential, and a few electric service companies have become interested in their extensive application. If this additional load is obtained on a real business basis and not merely as an inducement to acquire or hold a city franchise, as street lighting originally was, it will attract other light and power companies. Regardless, however, of whether utilities are interested in the business represented by traffic signals or not, progressive cities, towns and hamlets are installing them or contemplate doing so. If the signals are not to be operated from municipal plants, the companies will have to furnish the energy and, no doubt, maintain them in operating condition, as they do street lamps.

Therefore, with the prospect of a rapidly increasing number of electric traffic signals to operate and maintain, the net revenue obtainable will be dependent to a great extent on proper selection and installation of the equipment, since these two factors will greatly influence the operating and maintenance expense. Direct control of the selection is not usually within the province of electric service companies because they do not care to own the signals proper. However, utilities have an opportunity to guide municipal selection by equipping themselves to serve as impartial authorities on the construction requirements essential to low operating and maintenance expense. Right now it is doubtful whether many utilities are in a position to qualify as authorities on this subject. If not, they must educate themselves before systems are thrown on their hands to operate and maintain. This they can do by studying all types of traffic signals with a view toward ascertaining how well they meet requirements and by collecting all the information possible on unit operating and maintenance expenses. Where a utility is not asked for such information, it can without hesitancy offer it, for the unselfish reason that foreknowledge may save the city considerable money.

Wanted—MORE COURAGE

THE average household in America annually spends about $420 on automobiles, $100 on tobacco, $286 on women's clothes, $85 on men's clothes, $30 on radio, $25 to $30 on electric service and $10.88 on electrical equipment for the home. Probably not more than 15 per cent of the homes now connected to electric power lines have installed in them today what might be called a complete electrical equipment. This is a smaller percentage than five years ago, because we are taking on new homes faster than we are selling appliances for use in them.

What is the electrical industry going to do about it?

Hundreds of thousands of people wire up each year. Each family is eager for a modern home. They want all the comforts of electric service. But they never get it. It's never sold to them. Electrical manufacturers, central-station companies and dealers combined don't sell enough appliances to even keep up with the growth of the household market. At our present rate these people will all die—and so will we—before complete electrical equipment becomes the standard of the American home.

And the reason why the electrical industry is steadily falling behind the growth of this, its greatest market, is because *the electrical man is individually selling the American home too small an order.*

JOHN and Mary and their children represent the great American household market. How do they buy other things?

The automobile salesman comes to John and Mary and sells them a thousand-dollar or a fifteen-hundred-dollar car—complete. They want the car. That is the price. They buy—not first the engine, then the wheels, then the body, then the top—but a complete car.

The bathroom salesman also comes to John and Mary and sells them a white-tiled porcelain-equipped bathroom for $1,000 or $1,500, including the necessary plumbing. He does not sell this year a tub, next year a toilet, then a basin, then the floor and then the walls. If he had done so, then the tiled and porcelain bathroom would not now be the standard of the modern home. John and Mary want the bathroom not alone for comfort, but because it is a mark of social standing. They must be *modern*—so they pay the price and buy.

Why is it that these bathroom and these motor-car salesmen can obtain from the same home that electrical salesmen call on orders for complete equipment that costs $1,000 or $1,500, when the electrical salesman calls and comes away with an order totaling $50, or perhaps $150, for a single appliance—which is but a fraction of a complete equipment?

The automobile industry had the courage to go to the American home and sell expensive motor cars in spite of the low cost of a horse and buggy. The bathroom people had the courage to sell a thousand-dollar equipment despite the cheapness of the china basin and the tin bathtub. The electrical industry has not yet had the courage to go to John and Mary with the same big vision and full purpose and do a complete selling job.

HOW is the electrical industry to accomplish this? We cannot tell our selling men that they must work longer and walk faster, and sell more. Piecemeal purchasing will never make complete electrical equipment the standard of the American home. There is only one way:

We electrical men must approach John and Mary with a new sales philosophy and a new program designed to bring a fresh thought to them by offering a sensible solution of the social and economic difficulties that beset every household in the land. Here is the plan:

1. Let us prove the practical and personal advantages of meeting present conditions of cost and labor in the home by doing the housework electrically and modernizing the processes of housekeeping as men have modernized the methods of the office and the factory. Let us sell not just single appliances, but complete equipment.

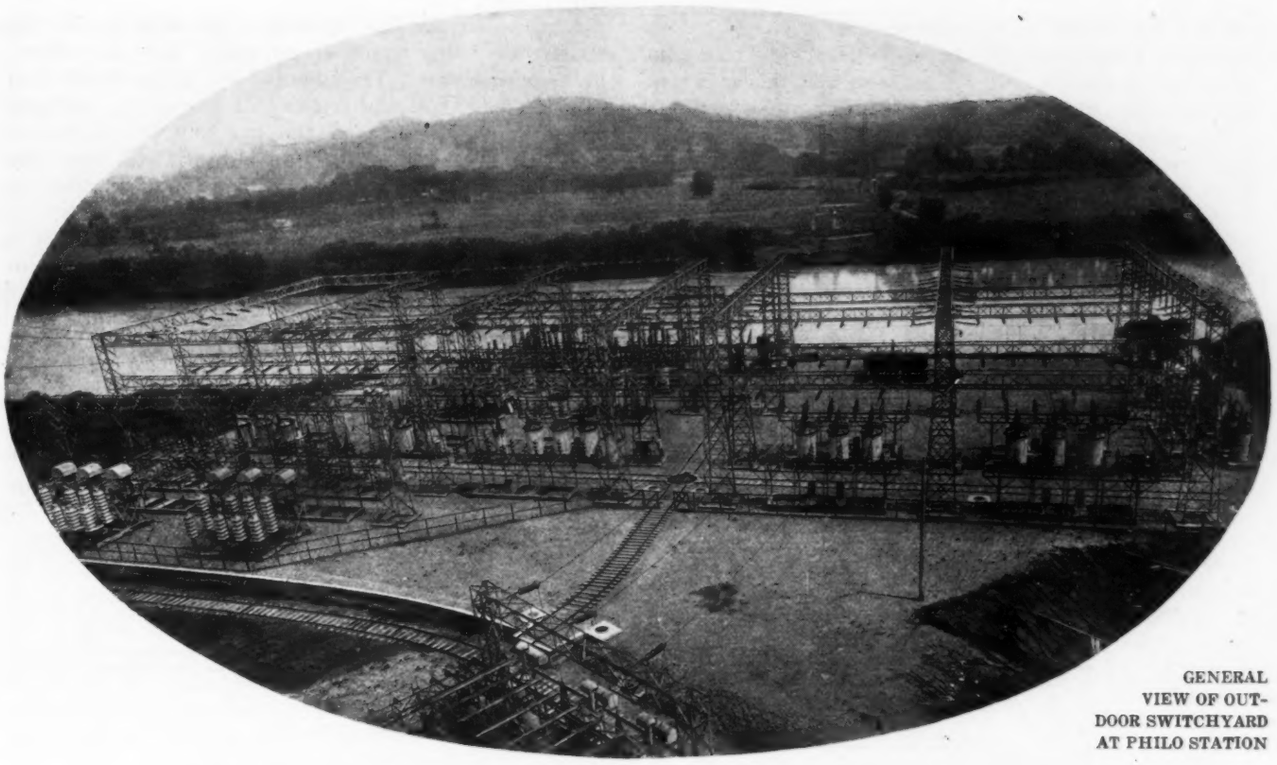
2. Let us show each household how the mortgage money can be made to pay for the heavy equipment—clothes washer, ironer, dishwasher, kitchen motor, refrigerator and, where the rate permits, a range and water heater—if these are screwed fast and permanently installed when the house is built or bought.

3. Let us also figure for the customer how to make the regular household budget pay for the auxiliary equipment—the vacuum cleaner, sewing machine, fan, toaster, percolator, waffle iron, heat pad and the rest—by setting up an easy-payment contract and a regular schedule of appliances, with a fixed appropriation of so much a month.

For John and Mary would not today possess and enjoy the white-tiled porcelain bathroom and the family car if salesmen had not come and "sold" them with eager enthusiasm and complete conviction, and they could not have bought if the salesmen had not also brought the suggestion of a way to help them finance these large purchases.

JOHN will do his part and so will Mary. They will gladly buy complete electrical equipment. They will give *our* salesmen, too, a thousand dollar order. They will do it just as soon as the electrical industry will back this bigger vision of the household market with more courageous selling.

And complete electrical equipment will become the American standard—first in the new better-class home—just as it was with the bathroom. Then the older and smaller homes, perhaps already partly equipped, will fall in line.



GENERAL VIEW OF OUTDOOR SWITCHYARD AT PHILO STATION

Philo Station Sets Record

Electrical Features and Controls—II

New Plant of the Ohio Power Company Operates on 14,300 B.t.u. per Kilowatt-Hour for Long Period — Design Details and Station Layout

By M. L. SINDEBAND and P. SPORN
American Gas & Electric Company

THE UNIT IDEA on which the arrangement of the mechanical end of the Philo plant was based was also the guiding principle in the design of the electrical end. In Fig. 8 there is shown a one-line diagram of the arrangement. It will be seen that each unit is connected through a low-voltage oil circuit breaker to a transformer bank and then to the 132-kv. bus, each generator and transformer constituting a unit and allowing neither to operate without the other. This arrangement was not deemed objectionable from the standpoint of maintenance, because it was believed that a minimum loss of time and loss of capacity would result if the entire unit were shut down and every piece or part of it gone over at the same time.

Each machine has its own auxiliary transformer that feeds the auxiliaries of the particular generator only, but a reserve transformer is provided for each two units to allow it to be used in case either of the two transformers is out of service. The switching arrangement contemplates no paralleling of generators on the 11,000-volt side, and but for the question of speed of synchronizing, no low-voltage breaker would have been employed. It was not felt safe, however, to synchronize a generator on a 132-kv. breaker, and the low-voltage breaker was therefore resorted to. The elimination of the low-voltage bus obviously eliminated the problem of heavy short-circuit currents with their concomitant high stresses necessitating special phase arrangements, etc. Further, the high values of rupturing capacity in the oil breakers had to be taken care of at 132,000 volts and could thus be taken care of much more easily. It will be seen from Fig. 8 that the auxiliary transformer is tapped to a bypass connection of the low-voltage breaker, thus making it possible to start the plant cold and then after the unit is in operation, by closing the lower of the two bypass switches and opening the upper one, to bring about a connection equivalent to the auxiliary transformer being tied in solidly on the generator terminals. Such an arrangement will permit clearing everything beyond the generator low-tension oil switch without in any way affecting the auxiliaries of the generator as long as the steam end and the generator proper remain unaffected.

Two distinct 132-kv. buses have been provided and the entire plant can be operated completely either on one bus or on the other; it was felt that for a plant

of this magnitude no reliance should be placed on less than two buses—that is, there should always be a complete bus in reserve. It will be seen that this is accomplished with only one oil breaker per circuit by utilizing motor-operated disconnecting selector switches. These have been arranged in sets of six on a common frame, floor mounted, thus permitting inspection and adjustment. A view of one of these groups is shown in Fig. 9. To provide for oil switch inspection and repair, a transfer or inspection bus has been provided, and this allows a single extra oil switch to be substituted for any oil circuit breaker, whether the circuit with which it is connected is on the main bus or on the reserve bus.

The low-tension breakers, auxiliary transformers and main transformers have all been placed close to the main building, making necessary only a very short cable run from the generator to the main transformers and

Each boiler fan has two motors mounted on the same shaft, one being a low-speed motor and the other a high-speed motor. The two motors of the forced draft fan are 2,300-volt squirrel-cage motors; the low-speed motor starts directly off the bus and the high-speed motor starts by means of an auto transformer mentioned above. The two motors of the induced draft fan are 2,300-volt wound-rotor induction motors, the starting and speed variation of which are obtained by the use of standard rotor resistances and motor-operated drum controllers. It was found that the full range of speed required for the induced draft fan motors could not be covered economically by a single motor; this was the reason for using two motors.

The low-speed motors are used, of course, for light boiler loads and the high-speed motors for heavy loads. The circuit breakers of the low-speed motors and high-

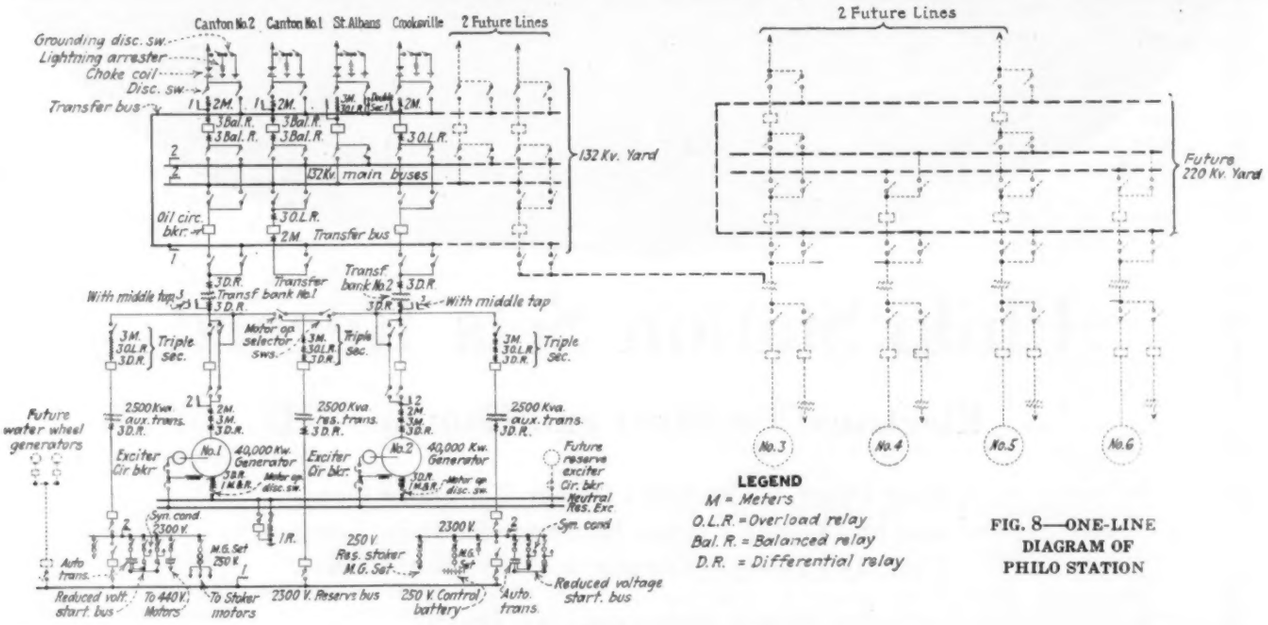


FIG. 8—ONE-LINE DIAGRAM OF PHILO STATION

from the auxiliary transformers back to the 2,300-volt bus inside. This is shown well in Figs. 10 and 11.

The placing of the transfer or inspection bus on each side of the two main buses shown diagrammatically in Fig. 8 makes possible the utilization of a single bay either for two feeders leaving in opposite directions, or for a feeder and transformer, or for a feeder and transfer switch. This gives ample room for clearances and operation without spreading the structure out too far. This can be well seen from the sections of the 132-kv. bus shown in Fig. 13, and it is also partly shown in the photographic view of Fig. 12.

All large auxiliaries are driven by 2,300-volt motors (and all auxiliaries, with the exception of a duplicate steam-driven boiler-feed pump, are electrically driven), which have been designed to start by throwing directly on the line. The exceptions to this are the motors driving the forced draft fans and the generator blowers and the few synchronous motors for which fractional voltage starting has been provided. Since the beginning of the operation of the plant, however, experiments have been carried on with a view of possibly eliminating this complication in the case of the fans and blowers, and the results so far seem to indicate that such a procedure will not harm the fans.

speed motors are interlocked so that only one motor can be run at a time, and the breakers are so interlocked that the closing of the breaker of one motor will automatically trip the breaker of the other.

The control is so arranged that the following combinations are the only ones possible:

1. Either the low-speed motor or the high-speed motor of the induced draft fan may operate alone. This combination is obviously not applicable to the forced draft fan.

2. The high-speed motor of the forced draft fan can operate only in conjunction with the high-speed motor of the induced draft fan.

3. The low-speed motor of the forced draft fan can operate in conjunction with either the low-speed motor or the high-speed motor of the induced draft fan.

In case of overload on either of the forced draft fan motors, a multi-contact relay is energized, which shuts down all fans, except the low-speed motor of the induced draft fan, which, if not already running, is started up. The same effect through the multi-contact relay is obtained in case of overspeed on the main turbines. Under this condition, the throttle and intercepting valves close, causing the reheat boiler doors to open, which in turn actuate the multi-contact relay.

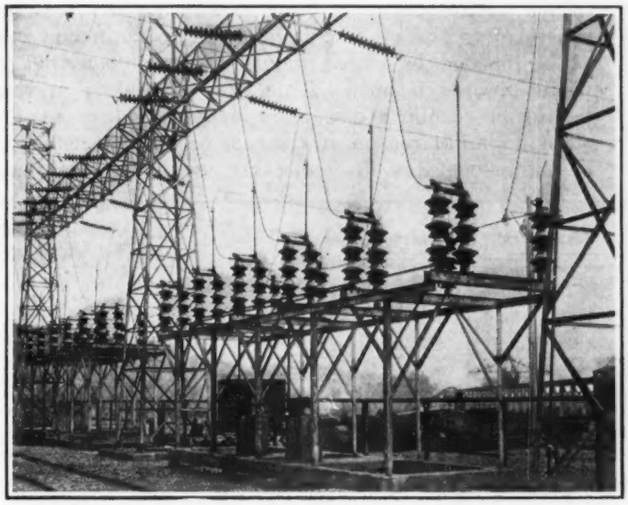


FIG. 9—MOUNTING OF 132-KV. MOTOR-OPERATED SELECTOR DISCONNECT SWITCHES

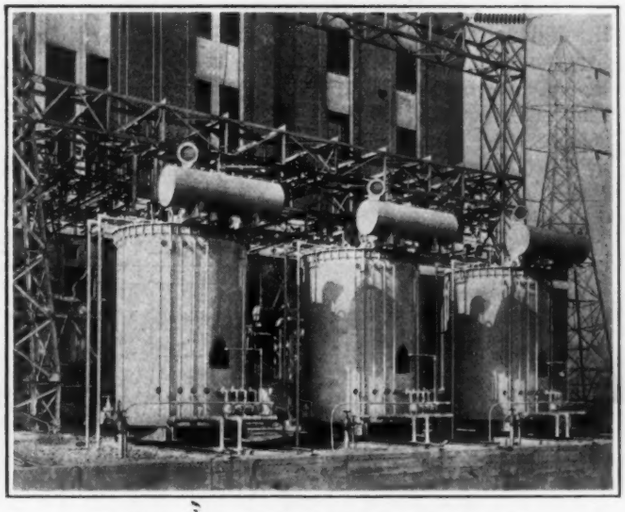


FIG. 10—STEP-UP TRANSFORMERS ARE PLACED NEAR THE BUILDING

Furthermore, in case of undervoltage at either of the motors used with the induced draft fans (which would necessarily be running in conjunction with a forced draft fan), the same effect is accomplished by interposing a definite time delay relay between the undervoltage and the multi-contact relays. The definite time relays are used to prevent shutting down the fans in case of momentary fluctuations in voltage of the supply system.

Overload on the high-speed motor of the induced draft fan would shut it down, after which the definite time and multi-contact being energized in turn would again shut down all the fans and start the low-speed motor of the induced draft fan.

In case of overload on the low-speed motor of the induced draft fan (which is relied upon in abnormal conditions), the motor shuts down, and if the low-speed motor of the forced draft fan is running at the same time, it too is shut down.

Interlocking of Oil Circuit Breakers and Disconnect Switches

An examination of Fig. 8 and of Fig. 14, which is a simplification of Fig. 8, will show that with the numerous disconnect switches there exist possibilities of improper operation and consequently of trouble. To reduce this to a minimum, a complete system of interlocking was developed (made comparatively simple by the fact that all important disconnect switches were motor operated).

Generator Field and Auxiliary Transformer Interlocks

To insure generator field excitation, the generator oil circuit breaker cannot be closed unless either or both the field circuit breaker and the circuit breaker controlling the feed to the generator field from the excitation bus are closed, as well as the synchronizing switch. For the same reason, neither the field circuit breaker nor the circuit breaker controlling the feed to the generator field from the excitation bus can be tripped unless the generator oil circuit breaker is open or both the former circuit breakers are closed, in which latter case, tripping one of the circuit breakers will still leave potential on the generator field from the other circuit breaker.

The auxiliary transformer oil circuit breaker cannot be closed unless its generator oil circuit breaker

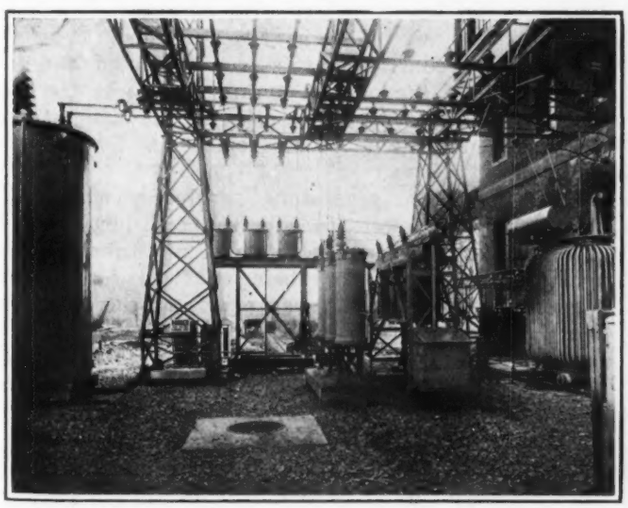


FIG. 11—UNIT AUXILIARY TRANSFORMERS AND CONTROLLING LOW-TENSION BREAKER. SHORT CABLE RUNS ONLY ARE REQUIRED TO SERVE THE TRANSFORMERS

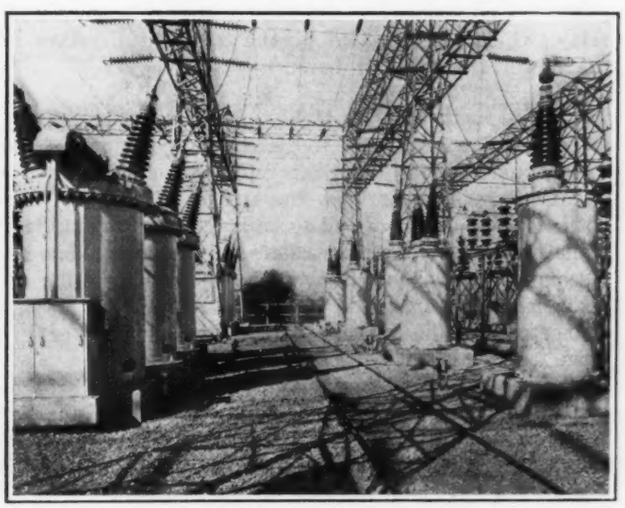


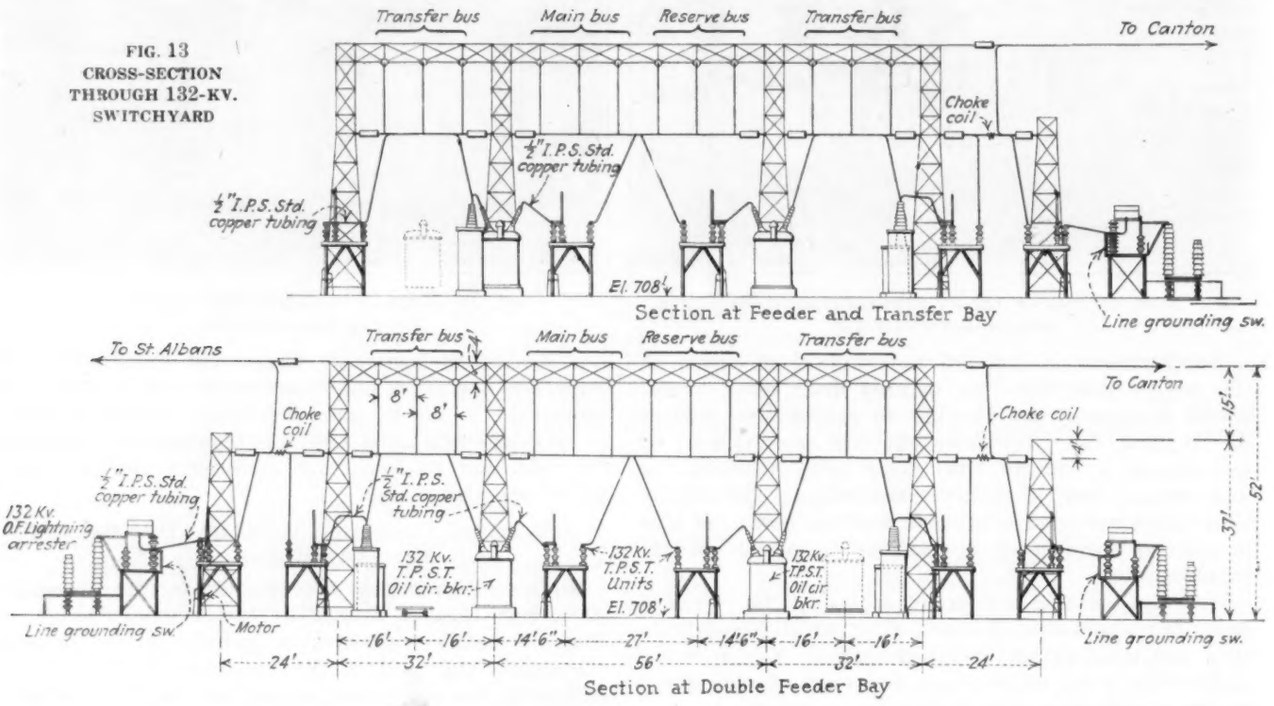
FIG. 12—SECTION OF 132-KV. SWITCHYARD, SHOWING SELECTOR DISCONNECT SWITCHES AT RIGHT, 132-KV. CURRENT AND POTENTIAL TRANSFORMERS IN CENTER AND OIL BREAKERS AT LEFT

is closed, and the latter cannot be closed except through a synchronizing receptacle. This makes it practically impossible to feed in on a dead machine. In case of internal trouble in the generator, a multi-contact relay is energized by the generator PQ-6 differential relays. The same multi-contact relay is also energized by PQ-6 overload relays located in the generator neutral

Each motor-operated disconnecting switch between transformers and oil circuit breakers to main bus cannot be opened or closed unless its accompanying oil circuit breaker is open. This will, of course, prevent opening or closing a disconnect under load.

For a similar reason, in the case of any given feeder, the motor-operated disconnecting switch to the main

FIG. 13 CROSS-SECTION THROUGH 132-KV. SWITCHYARD



leads. The following oil circuit breakers are tripped when the multi-contact relay is energized:

1. Generator oil circuit breaker.
2. Auxiliary transformer oil circuit breaker.
3. Power transformer oil circuit breaker.
4. The field or excitation bus circuit breakers after the generator oil circuit breaker has first tripped.

The generator oil circuit breaker is also tripped in case of internal trouble in the 45,000-kva. bank of power transformers, by means of a second multi-contact relay, which is energized by the differential relays of the power transformer bank.

RESERVE AUXILIARY TRANSFORMER INTERLOCKS

To make it impossible to tie the two sections of the 11-kv. bus together, or opening the motor-operated bus tie disconnects under load, the bus tie disconnects cannot be opened or closed unless both the reserve auxiliary transformer oil circuit breaker and the other bus tie disconnects are open. Conversely, the other tie disconnects cannot be opened or closed unless both the tie disconnects and the auxiliary transformer breaker are open.

The reserve auxiliary transformer oil circuit breaker can be opened or closed regardless of the positions of the motor-operated bus tie disconnects, and it must be closed through its synchronizing switch, since there is a possibility of tying the two turbines together.

All feeder oil circuit breakers are not interlocked other than through synchronizing switches.

All motor-operated disconnecting switches to transfer bus from transformers are not interlocked.

bus cannot be closed or opened unless oil circuit breakers to feeders are open or disconnecting switch to transfer bus is closed. Conversely, this disconnect cannot be closed or opened unless the oil circuit breaker is open or the main disconnect is closed. This is shown in full detail in Fig. 15.

PROTECTIVE ARRANGEMENTS

Motors. All auxiliary motors are protected by instantaneous overload relays set with current settings of approximately six to eight times normal. Various other elaborate arrangements were proposed and investigated and the present arrangement was the one that was finally decided upon as being the simplest and the one least likely to cause trouble due to improper operation.

Generator. The generators, as already mentioned, utilize outside blowers to supply a sufficient amount of cooling air. A closed system of air circulation is employed, surface coolers being utilized for cooling purposes. The general arrangement of these coolers and their place in the thermal cycle of the plant are shown in Fig. 4 (see page 358 ELECTRICAL WORLD, August 22, 1925). A bimetallic thermostatic relay is placed, however, in the intake chamber to give an alarm in case the air temperature reaches a dangerous value. Outside of this the generator is protected by the usual balanced scheme of protection, utilizing for the purpose instantaneous plunger type relays.

Transformer Protection. An examination of Fig. 8 will show the difficulties that are encountered in an attempt to arrange a balanced scheme of protection for

the transformers if the balancing current transformers were to be placed in the terminals of the high-voltage side switches and low-voltage side switches of the transformer bank. Besides the difficulty due to the tapping of the auxiliary transformer beyond the low-tension switch, there is also involved the difficulty brought about by the possibility of utilizing the transfer switch in place of the normal transformer switch. All these difficulties were cleared away by placing the bushing transformers in the terminals of the transformer proper.

Protection of Potential Transformers. Potential transformers on the 11,000-volt side are all fused using a series resistance; the 132-kv. potential transformers, which were necessary to make possible synchronizing among the various plants, have all been connected solidly without any disconnect or fuse, being placed on the line side of the oil switch.

Lightning Protection. Each of the 132-kv. lines is protected by an oxide film arrester. The question of whether or not to employ arresters was given considerable attention and it was finally decided to employ them. The station, which has been in service considerably over half a year and which has gone through one of the most severe lightning seasons, has so far experienced no trouble due to lightning, although the insulation of the station bus and of a good deal of the equipment on the buses is considerably lower than that of the line, and the lines themselves have experienced considerable lightning trouble. This does not necessarily prove the efficacy of the lightning arresters, but it is an interesting result nevertheless.

Line Protection. As seen by Fig. 8, the Crooksville and St. Albans lines are both protected by straight overload relays. The two Canton lines, which are on the same towers and are of exactly the same length, have separate overload protection on each of the lines, with an arrangement to give instantaneous balance protection when both lines are in circuit. As originally laid out, a locking out feature was provided that would delay one line for a period of about five seconds when the other line tripped on balanced protection. Six months' operation with this arrangement during particularly heavy lightning storms showed the desirability of taking out this locking out feature, as cases occurred where both lines apparently flashed over at the same time and the delay in clearing the second line due to this relay arrangement was invariably long enough to burn the conductor badly.

GROUNDING OF NEUTRALS

The 132-kv. transformers are all grounded solidly at Philo, and since the removal of the locking out feature on the relays referred to above the relay functioning has been entirely satisfactory—that is, sufficient ground current is obtained under all conditions and the current is apparently not heavy enough to cause any conductor burning.

The 11,000-volt neutrals of the generators, however, are grounded through a 2-ohm, 2,500-amp., one-minute outdoor resistor. From Fig. 8 it will be noticed that a short-circuiting switch is provided for this resistor, this being automatically actuated by thermal relay when the resistor temperature reaches 350 deg. C. It was felt not only that this arrangement would protect the resistor but that, should the grounding current last for any length of time but at the same time be

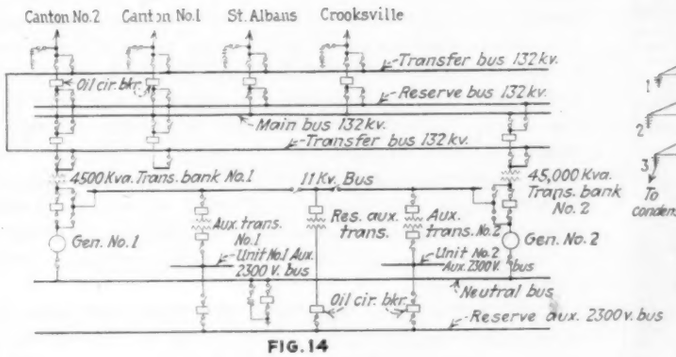


FIG. 14

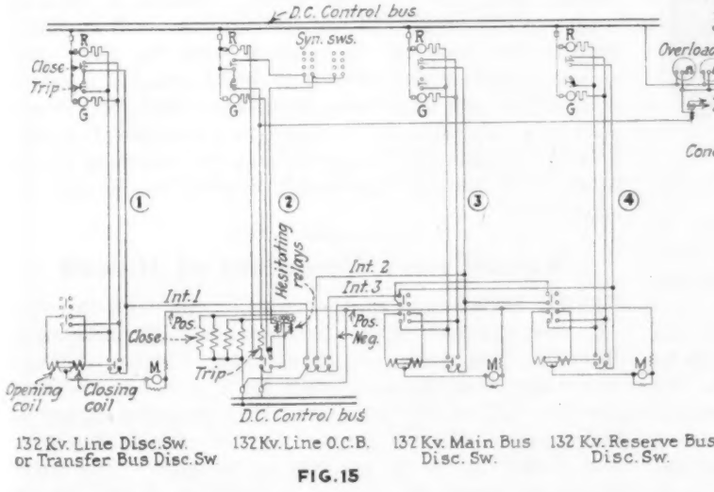


FIG. 15

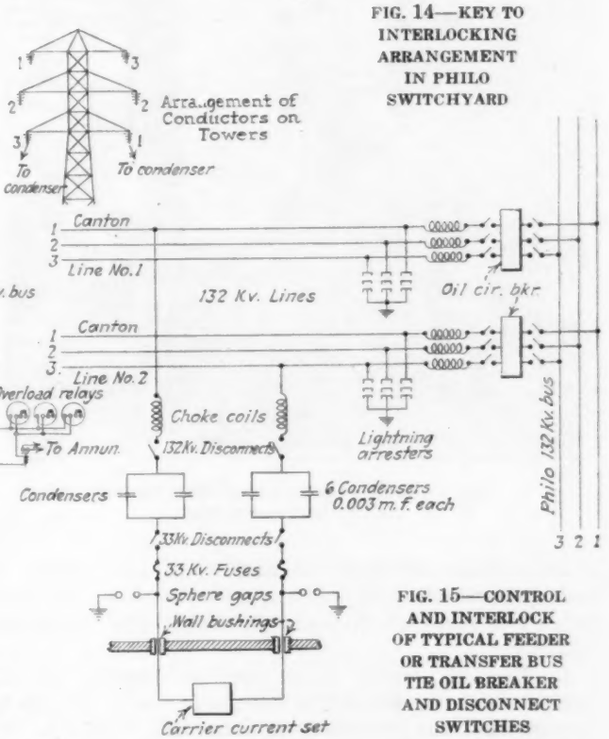


FIG. 16

FIG. 14—KEY TO INTERLOCKING ARRANGEMENT IN PHILO SWITCHYARD

FIG. 15—CONTROL AND INTERLOCK OF TYPICAL FEEDER OR TRANSFER BUS TIE OIL BREAKER AND DISCONNECT SWITCHES

FIG. 16—SCHEMATIC DIAGRAM OF CARRIER CURRENT EQUIPMENT AND CONNECTIONS

insufficient to cause relay operation, the short-circuiting of the resistor would, of course, increase the ground current and both protect the resistor and give the necessary increase in current for relay functioning.

COMMUNICATION WITH TWO TYPES OF RADIO IS OBTAINED

For plant intercommunication a private automatic telephone is employed. For communication between Philo and Canton and Windsor, and between Philo, St. Albans and Crooksville, carrier current equipment of the interphase type is employed. The coupling to the Crooksville and St. Albans circuits is straight wire coupling. In the case of the Philo-Canton lines, however, the arrangement of the two circuits on the towers is asymmetrical (see Fig. 16), making the wire coupling impossible, and condensers had to be resorted to. Various types were considered, the type finally chosen being

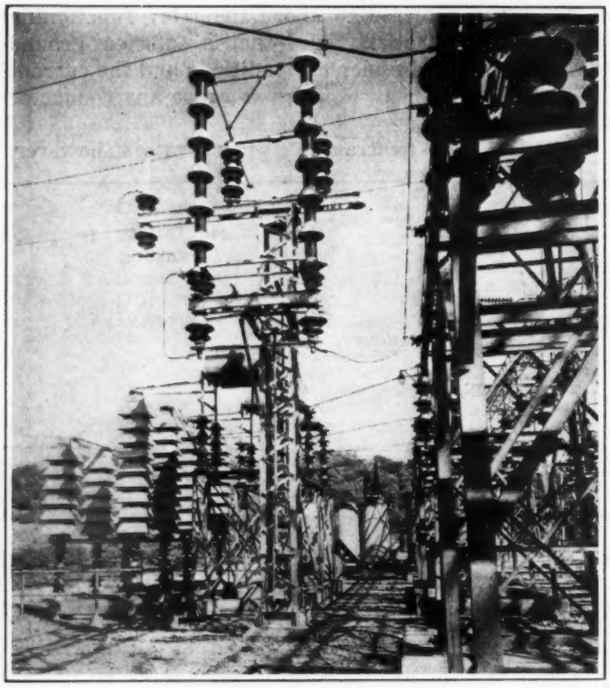


FIG. 17—MOUNTING OF CARRIER CURRENT COUPLING CONDENSERS

a mica condenser built in 22,000-volt units with an arrangement of six in series to give the necessary insulation and two such stacks in parallel to give the proper capacity.

In Fig. 16, which is a one-line diagram of the arrangement, the protective scheme is shown. It will be noticed that the condenser is connected solidly to the 132-kv. lines without any fuses or other protective equipment, the arrangement being such that phase 1 of one line and phase 3 of the other (the two communicating phases) are coupled by the same set of condensers. In Fig. 17 the method of mounting these condensers is shown. Approximately six months' experience of actual operation with them has brought forth no faults and has shown them to be fully adequate to stand up under the required service on the transmission system.

The plans of Philo were worked out jointly by Sargent & Lundy and by the engineers of the American Gas & Electric Company.

University of Michigan Has a Completely Electrified Hospital

ELECTRICITY will be used for numerous and varied purposes in the hospital of the University of Michigan, now almost completed, which is virtually a small city under one roof so far as activities are concerned. It has accommodations for 650 patients.

To keep foodstuffs in perfect condition there is a 6½-ton electrically operated refrigerating plant with separate storage rooms and innumerable refrigerators throughout the establishment. In the bakery are three large electric ovens having a capacity of 180 loaves at one baking, a huge bread-mixing machine, a frosting and whipped-cream mixer and a biscuit-cutting machine also operated by electricity. Motor drive is used for a 3-peck potato peeler, a continuous dishwasher, capable of cleansing 2,500 pieces an hour, and fourteen smaller machines.

Eleven operating rooms are specially illuminated and provided with electrical conveniences. In the clinic is a system of circuits with receivers enabling students to listen to the lecturer's stethophone. A cardiagraph "exchange" whereby the heartbeat of any patient anywhere in the hospital can be recorded in the cardiagraph room is a feature of the hospital. This "exchange" is handled in the same way as a telephone exchange. Telephone wall jacks in 100 rooms permit rapid communication and even enable convalescing business men to transact urgent business. To prevent the rays from the X-ray department affecting adjoining rooms the walls are cased in lead.

Adequate ventilation, which is, of course, particularly important in hospitals, is afforded by thirteen large motor-driven fans. Transportation between the floors is provided by ten passenger elevators and twelve dumbwaiters.

Great precautions have been taken to make sure that imperative electric service, especially in the operating rooms, shall not be interrupted. Besides a reliable service connection with the Detroit Edison Company's system, this hospital, in common with the older university hospitals and university buildings, has a power plant of its own which also furnishes steam for various purposes. In addition to these two sources of power, a farm-lighting plant is installed in the basement of the hospital to provide emergency service or operate an elevator.

Water-Power Resources of Hawaii

THE Department of the Interior, through the district engineer of the Geological Survey stationed at Honolulu, has prepared an estimate of the potential water power of Hawaii based on a study of the flow and the fall of the streams. This potential power is estimated at 174,000 hp. for 50 per cent of the time and 72,000 hp. for 90 per cent of the time. The latter is divided among the islands as follows: Kauai, 34,900 hp.; Oahu, 5,300 hp.; Molokai, 1,700 hp.; Maui, 15,800 hp.; Hawaii, 14,700 hp. The rated capacity of the waterwheels and turbines now in use is about 25,000 hp. As the water available for generating power in the islands is widely scattered in small streams and would require electric interconnection for efficient use, and since much of it has been diverted to irrigation, the possibility that it will all be developed is extremely remote.

Constant Potential Transmission Line Diagram

By FRANK G. BAUM
Consulting Engineer

THERE has been a great deal of interest in the last few years in long-distance transmission lines. The analytical calculation of such lines has been ingeniously developed by a number of engineers. The operating engineer, or manager, or load dispatcher requires a simple diagram on which the results are simply shown without calculation.

It has been generally supposed that the effect of distributed capacity loads and synchronous condensers could not be accurately shown diagrammatically. A diagram has been developed which shows the results at a glance, as shown by the base diagram in Fig. 1; and by properly combining several of these diagrams for the same length or for different lengths of line sections the results are shown as simply as for the ordinary line, as shown by Figs. 2 and 3. And Figs. 2 and 3 show in a simple way the great effect of the distributed capacity and the effect of the synchronous condenser stations at the end of line sections.

Without the line capacity and synchronous condensers at the ends of the line sections, the reactance pressure of the line would continue in direction along the line AG, Fig. 1. The effect of the capacity of the line and the condenser is to turn this along the arc AQ, giving a constant voltage system.

Note then, Figs. 2 and 3, what the effect would be if the reactance pressure continued at right angles to the base line at A. Here is shown at a glance the great effect of the synchronous condenser station along the line, so that argument as to the benefits are shown visually. The mathematical equations do not show this result unless one makes a corresponding diagram.

In operation the long transmission system is more stable than many (of whom I was not one) expected. All the factors are not yet fully known, but large-scale tests on long high-voltage lines under way for some time show encouraging results, and one must be cautious to predict the limitations of the long high-voltage transmission system.

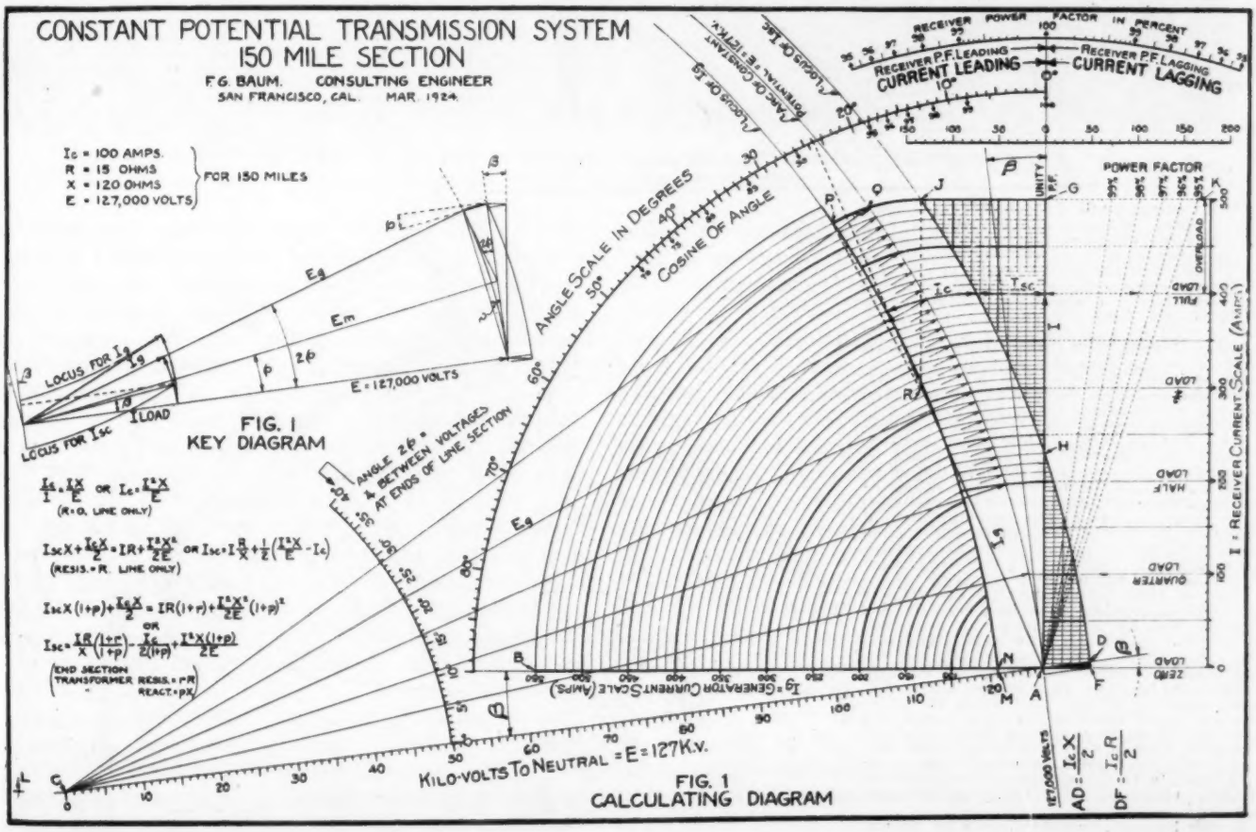
From point A draw lines AB and AC, making angle $\beta = \tan \frac{R}{X} =$ (6 deg. 54 min.) at A, and make $AC =$ kilovolts to neutral $= E$ to any suitable scale as shown. Extend CA to D, making $AD = IcX \div 2 = 100 \times 120 \div 2 = 6{,}000$ volts, using the same scale as used for AC. Draw DF perpendicular to AD at D, making $DF = IcR \div 2 = 100 \times 15 \div 2 = 750$ volts. AF will then be an extension of AB, AD and AF, making angle β at A.

With C as center and CA as radius, draw "arc of constant-potential" AQ as shown. Also with C as center and CD as radius draw a parallel arc "locus of *Isc*." Now draw AG perpendicular to BA at A. (AG is really $I\sqrt{R^2 + X^2}$). Construct a load scale (I scale) in amperes on AG, making the distance from A to the load equal to IX, measured on the same scale to which AC was drawn. For example, AG is shown on the diagram equal to 500 amp. load (non-inductive), therefore $AG = IX = 500 \times 120 = 60{,}000$ volts when measured on the E scale. Similarly for $I = O$ amp. $AG = IX = 0 \times 120 = 0$; therefore point A = zero load. The perpendicular distance from any load I ($= JG$ for 500 amp. load current) on AG to the arc "locus of *Isc*" gives the magnitude of the *Isc* current to correct for line resistance and reactance for any particular load. AD shows the lagging current at zero load. At point H the synchronous condenser is merely idling.

The *Isc* current (the leading or lagging current to be supplied by the synchronous condenser) thus obtained can be measured in amperes on the same scale as $AG = I$, and the current is leading at all loads from H to G and lagging at all loads from H to A, H being the point where "locus of *Isc*" crosses AG. (H is also obviously the point of zero *Isc* current and the point when *Isc* current changes from leading to lagging). Thus $GJ = 136$ amp. $=$ *Isc*, the leading current to correct for line resistance and reactance at 500 amp. load.

To obtain *Isc* current to correct for power factor: $AG =$ unity power factor. Draw AK, making angle θ with AG so that $\cos \theta = 95$. Similarly draw other lines such as 96 per cent, 97 per cent, 98 per cent, 99 per cent power factor, so that $\cos \theta =$ power factor. Draw GK perpendicular to AG at G. Then length $GK = 164$ amp. when measured on AG scale and is the necessary *Isc* current to correct for power factor for 500 amp. load at 95 per cent power factor. Similarly, the perpendicular distance from any load on AG to the power factor line gives the *Isc* current for that load and power factor when measured on AG scale.

To obtain receiver power factor for any load: Consider a line drawn from J to A, making angle θ with AG; then $\cos \theta =$ receiver power factor $= 96.5$ per cent power factor (leading) at 500 amp. load. (The receiver power factor for this load is leading, since *Isc* current represented by JG is leading.) The receiver power factor is therefore the cosine of the angle whose tan $=$ *Isc* $\div$ I, and is leading when *Isc* is leading and lagging when *Isc* is lagging. An arc scale showing receiver power factor is drawn on the diagram so that the cos θ with AG is given in per cent power factor.



To use this scale, place a straight edge running through A and the point on "locus of Isc" corresponding to the load I. Where this line cuts the receiver power factor arc, the per cent power factor at that particular load may be read.

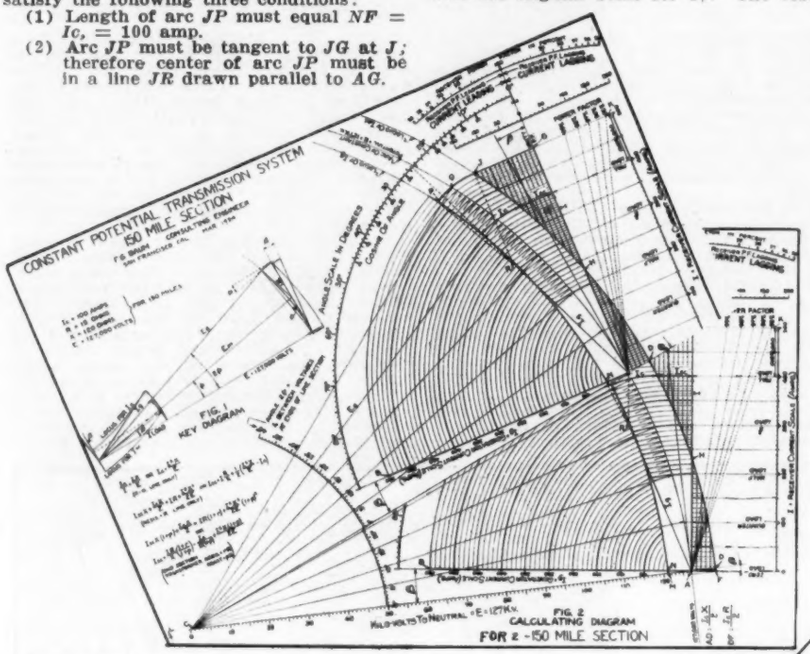
To obtain generator current (Ig) necessary for a given receiver current (I): Lay off AM on AC equal to $AD = IcX \div 2 =$ 6,000 volts. Note that AD is the voltage rise we would get, without condenser, due to the charging current flowing over X. Draw CL parallel to AB (to left of C) and equal to AF. With L as center and LM as radius draw arc "locus of Ig." Where "locus of Ig" crosses AB, call point N. We now have $MA = AD$ and $MA + AD =$ 12,000 volts; but 12,000 volts ÷ 120 ohms reactance = 100 amp. = Ic, or line-charging current; therefore $MD = 100$ amp. = line-charging current Ic. At no load the condenser takes one-half the charging current, namely, AD, and the generator takes the other half, AN. Hence at no load AN is the charging current carried by the generator. (For practical purposes $MD = NF$ = 100 amp., or exactly $MD = 100$ amp.,

$$NF = \sqrt{\left(\frac{12{,}000}{120}\right)^2 + \left(\frac{750}{120}\right)^2} = 100.74 \text{ amp.})$$

Now taking the 500-amp. load condition for analysis, we know that the arc JP (arc JP represents the charging current) must satisfy the following three conditions:

(1) Length of arc JP must equal $NF = Ic$, = 100 amp.

(2) Arc JP must be tangent to JG at J; therefore center of arc JP must be in a line JR drawn parallel to AG.



(3) Central angle for arc JP at R must equal central angle of arc AQ (AQ is the constant voltage of transmission) at C. (i.e., angle of arc PRJ = angle of arc ACQ = angle of arc 2ϕ).

By assuming angle of arc $ACQ = 2\phi$ we can calculate a preliminary radius $RJ =$ 57.296 $(NF) \div 2\phi$ in degrees; and by process of trial we can determine a radius RJ which will satisfy all three conditions. Note that JP is the charging current in magnitude and direction for $I = 500$ amp. ND being the charging current at no load, and for the intermediate loads ND moves successively, as shown, until it finally becomes JP at $I = 500$ amp. Note also that the voltage due to the charging current is JQ at $I = 500$ and that this voltage at no load is AD, and the intermediate values as shown. The charging current and the voltage correction due to the charging current thus change only slightly in direction from no load to full load, the magnitude remaining practically constant. (Note that point P will always lie in "locus of Ig.")

Having thus determined the arc PJ, we have $AP = Ig$ corresponding to $AG = I$ and we find $Ig = 528$ amp. for $I = 500$ amp. The length AP may be scaled using the same ampere scale as on AG, but for convenience in reading the diagram we have drawn an Ig scale in amperes along AB, using point A as zero and using the same scale as used for AG. With A as center, arcs have been swung from this Ig scale to "locus of Ig," so that from P or other corresponding load point we may follow these arcs directly to the Ig scale without necessitating the use of a scale to measure AP, etc.

It can be seen, therefore, that by taking any load on the I scale we can follow all of the conditions of that load by following the guide lines clear through from the I scale to the Ig scale.

To determine the generator power factor: Drawn between the extensions of right angle lines AB and AG is a 90 deg. arc with degrees marked and scale in 30 min. division. On the inner side of the same 90 deg. arc is a scale of cosines corresponding to the angle. Since cos θ = power factor, the power factor corresponding to any angle or the angle to any power factor may be read direct on this bi-scaled arc.

Note that the voltage phase position at the receiver or beginning of the line section is CA and at the generator CQ; that is, the voltage angle between the ends of the line section is ACQ. The current phase position at the receiver is AG and AP at the generator, hence the current angle between the ends of the line section is angle PAQ. The angle between voltage and current at generator is therefore angle of arc ACQ — angle of arc PAG.

Taking the 500-amp. load condition, the angle of which the cosine is the generator power factor = angle of arc ACQ — angle of arc PAG, which may also be written generator power factor = cos of (2ϕ — angle of arc PAG). Angle PAG can be measured graphically by laying a straight edge along AQ to intersect the 90 deg. arc. Angle 2ϕ can similarly be found by the intersection of a straight edge from C to Q with the angular scale for 2ϕ. The cosine of the difference between two angles can then be found on the parallel arc degree and cosine scales. Example: 500-amp. load; $2\phi = 28$ deg. 50 min.; angle of arc PAG = 25 deg. 40 min.; 2ϕ — angle of arc PAG = 28 deg. 50 min. — 25 deg. 40 min. = 3 deg. 10 min.; cos 3 deg. 10 min. = 99.8 per cent generator power factor.

To make the diagram complete for ready reference, generator power factor for various loads may be determined and generator power factor scale constructed on "locus of Ig" from point P to N, using the values thus obtained. This adds greatly to the ease with which the diagram may be used and enables all values to be read in one direct passage through the diagram, such as K to G to J to Q to P and then around circular arc to Ig scale on AB.

Note from the key diagram that the current lines in the calculating diagram are 90 deg. advanced. This makes it possible to work with only one set of voltage and current lines.

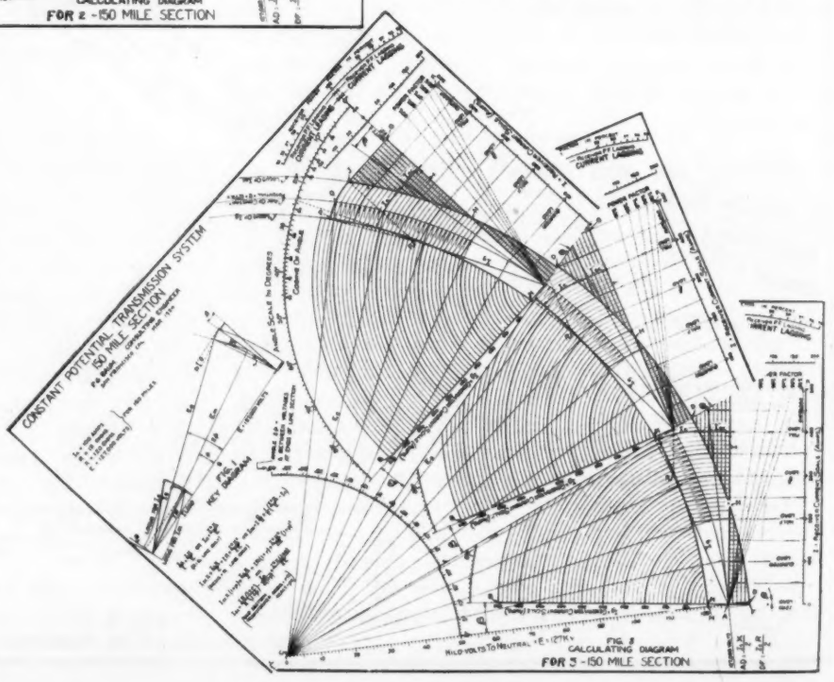
Changes of load are represented along the line AG. Small or large load increments may be studied. Changes of power factor are represented along KGJ. Changes of charging current are represented by the lines DAN to JQP, and changes of voltage compensation due to the charging current by the lines AD to JQ. The synchronous condenser current locus for constant voltage is shown by the arc DHJ and the magnitude by the length between the arc DHJ and the line AG. The generator current locus is along the arc NP and the generator current in magnitude is from A to the particular point on the locus. Changes of voltage of receiver or generator can be best worked out by assuming point A fixed and the point C to move in or out as the voltage decreases or increases. Changes in length of line sections change $AD = IcX \div 2$, or AD varies as square of length of section. The length $AG = I\sqrt{R^2 + X^2}$ varies directly as the length of line and load current.

Accuracy sufficient for practicable purposes is obtainable.

Diagram for Several Line Sections

By properly combining the prints of several diagrams such as Fig. 2, and having the points C coincide and placing the point A at the point along the arc AQ corresponding to the load, the diagram for several line sections may be made. In Fig. 3 is shown a diagram for three 150-mile sections. The load at the receiver is 400 amp., and due to losses this becomes 424 amp. in the second section and to 450 amp. at the beginning of the generator section, and becomes 477 amp. at the generator transformers. (Total losses taken at 6 per cent per 150-mile section.) Diagrams may also be made that will show the effect of power taken off the line or supplied to the line at the end of line sections and the effect on the load on the synchronous condensers at the line sections.

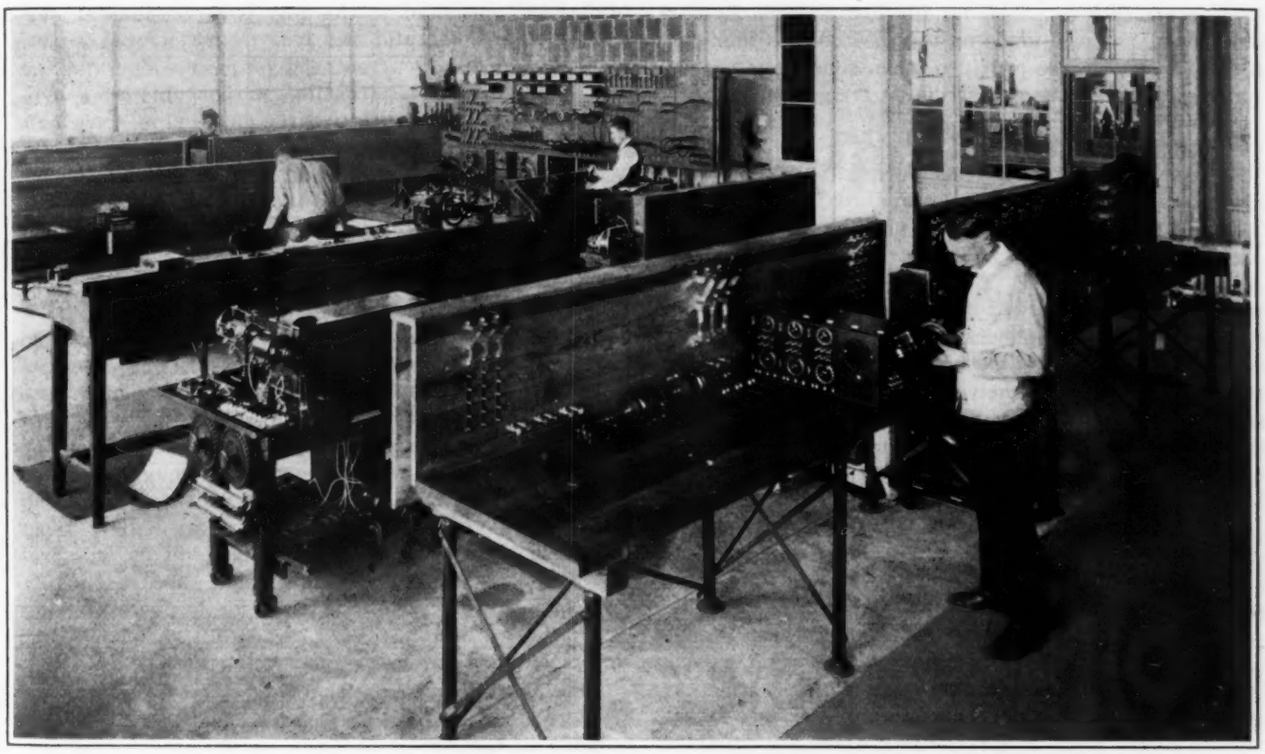
See Plates XV and XVI, Atlas of U. S. A. Electric Power Industry, by F. G. Baum, McGraw-Hill Co., 1923.



Electrical Standardizing Laboratory

Alhambra Plant Test Department of the Southern California Edison Company Provides Facilities for Calibrating All Types of Instruments Used in Central-Station Work —Flexibility Is Important Feature of Laboratory Tests

By W. R. FRAMPTON
Superintendent Test and Meter Department
Southern California Edison Company, Los Angeles, Cal.



VIEW OF SOUTH HALF OF ELECTRIC STANDARDIZING LABORATORY AT ALHAMBRA SHOPS OF THE SOUTHERN CALIFORNIA EDISON COMPANY

IN THE new Alhambra shops of the Southern California Edison Company a standardizing laboratory has been provided that maintains the company's precision instruments and provides the fundamental standards necessary in the calibration of the numerous types of instruments used by the different sections of the test department. The primary equipment consists of standard cells, potentiometers, resistances, shunts, thermometers, current and potential transformers, which are submitted periodically to the Bureau of Standards for certification of accuracy.

As the accuracy of the company's watt-hour meters is dependent upon the accuracy of the portable test meters, against which they are compared, no small amount of attention is given to the maintenance of the portable apparatus. Secondary standards used by the test men in the meter shop and in field testing are periodically compared with the certified laboratory standards. In addition to the usual error due to voltage, current, frequency and power factor, attention is given to the effects of temperature changes.

The semi-annual tests of railway delivery watt-hour meters involve many details. The quarterly standardization of standard cells, voltmeters, wattmeters, current transformer and test meters requires the attention of three laboratory men approximately one week preparatory to testing the delivery watt-hour meters. Prior to the installation of the delivery apparatus, the potential transformers are tested for ratio, phase angle, exciting current and core loss, considering the secondary burden to be imposed. The current transformers are assigned to the watt-hour meter elements and plainly marked and are always so connected for tests or in service. The length and size of current transformer secondary leads are always considered, also any indicating wattmeters or ammeters that may be in the secondary circuit. The meter, with current transformers, is adjusted at heavy and light loads, the elements are balanced, and adjusted for low leading and lagging power factors; a seven-point correction factor curve is plotted considering the potential transformer error, line voltage, power factor and room temperature. This curve is used by the record department in computing the actual kilowatt-hours delivered. The meter is then installed. If a meter has been previously installed, it is replaced by the recently tested meter and the re-

moved meter returned to the laboratory and a seven-point "as found" correction factor curve plotted, also for use by the record department.

Indicating wattmeters, voltmeters, ammeters and all other types of instruments are periodically compared with the certified laboratory standards and the observed errors are recorded and are available at any time. Correction curves are plotted for the instruments that are subject to considerable service. Special calibrations are given instruments prior to and following their service on important investigations, such as transformer and generator acceptance tests, heat runs and dry outs. New switchboard instruments and apparatus received from the manufacturers are given acceptance tests before they are sent out for installation. Repairs and calibrations are made on the instruments damaged in service; scales are provided when conditions require changes in capacities of instrument transformers.

LABORATORY EQUIPMENT

Current and potential transformers are compared periodically with the certified standards, and errors of ratio and phase angle are recorded. Special consideration is given to the secondary burdens imposed on the transformer under test. Exciting current and core loss values are also recorded for future reference. The Silsbee method is employed in current transformer investigation, while two methods are used in potential transformer tests—namely, the Leeds & Northrup method, similar to the Silsbee current transformer principle, and the Western comparator voltmeter method, the latter when ratio values only are desired. A special table with the standard transformer potentials of 440, 1,100, 2,200, 4,400, 6,600, 16,500, 33,000 to 110 volts and currents of 10, 20, 40, 1,200, 4,000 to 5 amp. is permanently connected and is used for instrument transformer testing.

The laboratory instrument tables have been so designed that the standard instruments are never moved. The source of voltage and current is plugged from the switchboard to the table according to the type of apparatus under test. Special wired tables are provided for voltmeter, ammeter and wattmeter testing. Switchboard facilities provide direct current up to 2,000 amp. and potential including 600 volts, while alternating current sources supply fifty and sixty-cycle current up to 440 volts and 1,000 amp. By means of interconnecting wire-ways in the floor, any table may be connected to the switchboard or to any other table. By the same means the laboratory switchboard may be connected to switchboards in the apparatus department or in the meter department. The accompanying illustration shows a portion of the laboratory.

An Epstein iron loss-measuring device is employed in the determination of losses of the sheet iron used by the precision machine shop in the manufacture of current transformers for line ammeters. Two oscillographs, a General Electric model EM and a Westinghouse new type portable, are employed in the investigation of transients and other determinations in which wave form and phase relations are an important issue. Special instruments and apparatus for investigations such as water velocities in penstocks, temperatures in conduits, etc., are developed.

The standardizing laboratory covers a floor space of 40x55 ft., with three rooms adjoining; a specially built 12x20-ft. ventilated battery vault, in which all batteries and a battery charging panel are installed; a 12x20-ft. motor-generator room, which houses all rotating equipment, and a 12x15-ft. instrument room.

The motor-generator equipment consists of two extraordinary sets; one, a 5-hp., 220-volt induction motor driving a 2-kw., 10-volt, shunt-wound, direct-current generator, and also a 2-kw., 600-volt, shunt-wound generator. This set is used for direct-current testing and the charging of approximately 100 Edison batteries. The second set consists of a 5-hp., 10-volt, three-phase, alternating-current synchronous motor, driving a 4-kw., 10-volt, shunt-wound, direct-current generator, which is also equipped with a 600-volt commutator. The latter set is also used in an inverted manner—that is, a battery of thirty-six A12 Edison cells, properly arranged, is connected to the 10-volt direct-current output of motor-generator set No. 1 and is used as the input to the direct-current end of motor-generator set No. 2, driving the alternating-current unit as a synchronous generator with a three-phase sine wave output of 10 volts. This is stepped up through 3 to 7½-kw. transformers to 110 to 220 or 440 volts for potential. The current is taken from the 10-volt source. This arrangement of machines and battery has been found very flexible and satisfactory in the standardization of test meters where consideration is given to the various values of current, potential and frequency.

Power factor variation at the present time is obtained by the use of phase-shifting apparatus, but specifications have been completed for a third unit which is to be attached to motor-generator set No. 2. This unit is to be a three-phase sine-wave potential generator the stator of which will be movable through a motor-controlled rack and pinion arrangement, permitting the potential to be shifted 180 electrical degrees from the current output of the 10-volt unit. This will provide power factor adjustment without the usual potential variations associated with most phase-shifting devices.

NINE-PANEL SWITCHBOARD

The laboratory switchboard, 20 ft. long and 7 ft. high, is made up of nine ebonite panels. On Panel 1 is mounted the circuit breakers, switches and compression type carbon rheostats for the control of 2,000 amp. direct current at 15 volts. Panel 2 is the terminal board for thirty-six Edison A12 450-amp.-hour batteries, which provide direct current at 1.5 to 54 volts. This current is switched through Panel 1 to a shunt table through ⅜x4-in. copper busbar, and then to a wattmeter table through No. 4/0 copper conductors. This table is equipped with reversing current and potential switches for the standardization of dynamometer type instruments.

Panel 3 controls the operation of motor-generator set No. 1, which may be connected on the Edison fifty-cycle system or to the sixty-cycle source generated in the apparatus department. The 10-volt direct current output from both motor-generator sets is switched on this panel, which also serves as the terminal of a 150-cell Edison BB4 20-amp.-hour potential battery provided with 7.5 and 15-volt steps from 0 to 225 volts. A rheostat with 120-5-volt steps is here installed for the control of the 600-volt direct-current potential. Panels 4 and 5 control the operation of motor-generator set No. 2, which may be driven either by motor-generator set No. 1 or by the Edison A12 battery, generating a 10-volt three-phase source, or it may be driven by the fifty or sixty-cycle source generating 10 and 600 volts direct current.

Plug and jack arrangement is provided in the field circuits of all direct-current machines so that the field excitation can be controlled from any test table. All machines may either be self-excited or separately excited. On Panel 6 provision is made for the switching of potential up to 440 volts, frequency from twenty-five to sixty cycles, and current up to 1,500 amp. at 5 volts. This is for the operation of the current and potential transformer test table. Three 7½-kw. 5-10/110-220-330-440-volt transformers are also controlled on this panel.

Panels 7 and 8 have forty-two jacks each. By means of plugs and jumpers, fourteen laboratory tables are supplied with the various potentials required. Each table is connected by six conductors, either No. 4 or 4/0, depending upon the type of table. Panel 9 is used as an interdepartment terminal. Six No. 2 rubber-covered and three No. 2 cambric-covered conductors interconnect the standardizing laboratory and the apparatus department. Six No. 2/0 rubber-covered conductors interconnect the standardizing laboratory and the meter department. By this means any department may be supplied with sources of energy.

Board buses are installed along the entire switchboard, reducing the length of the connecting jumpers to a few feet. Alternating and direct-current switchboard meters are so installed that they may be connected in the various circuits. Ampere-hour meters are used to determine the condition of the Edison A12 batteries. Alternating-current regulation is obtained by many devices, including carbon rheostats, wire resistors and adjustable reactors. Stillwell regulators provide the potential regulation.

Neglected Commercial Opportunities

Why Do Sales Lag Behind Engineering Development?—Pathetic Indifference of Some Executives to Merchandising Needs—Improvement Bound Up with Study of Load Curves and Cultivation of Good Will

By J. E. DAVIDSON
President National Electric Light Association

"THERE'S something wrong with the commercial branch of the power and light industry. What is it, and what is going to be done to remedy it?"

It was but a few hours following my election as president of the National Electric Light Association when a manufacturer of electric appliances in a Mid-Western city shot this question at me. Having knowledge that he was conservative in thought, I placed a great deal of confidence in what he said.

I have always had definite views in regard to this branch of our industry, but following the question put to me by the manufacturer, I decided to pay it special attention on a trip East I planned to make and during which I knew I would have the opportunity of meeting many executives of power and light companies. Of many of them I asked answers to definite questions, and from others I obtained general facts during routine conversation. That a few executives of power and light companies had vague ideas, or none at all, in regard to merchandising of electric appliances was really pathetic. They seemed to have a lack of interest and apparently did not "care whether school kept or not" in the commercial field.

Less Than Half of Companies Merchandise

I was surprised very much when I found out that only 49 per cent of the power and light companies are now doing an active merchandise business. This is especially true in the small communities, usually supplied with electrical energy by managing companies. Thus a serious commercial problem—undoubtedly the greatest of immediate importance—confronts the central-station industry. It is "selling" to the executives the great possibilities yet uncovered or untouched in the commercial field. Once the executives are really "sold," it will not be a difficult task to convince the minimum-bill customers.

Executives, especially those of managing companies, should increase their interest in the commercial activities of our industry. If they obtain the proper conception, they will readily see that in order to increase their net earnings they must first increase their gross earnings and that increased activity in the commercial field will, without a question of a doubt, bring increased gross.

More use of electrical energy is being brought about without effort, because of the development of lamps and lighting equipment, washing machines, electric refrigeration, vacuum cleaners, the radio and other appliances generally. Radio has resulted in longer hours of use of electric light in the home, and the new radio reception, by which power will be obtained from the socket, will also bring increased load. However, this is not enough. It is our duty in the fulfillment of our franchise obligation to acquaint the people with every method of using electricity that now exists. We are far from the saturation point as regards washing machines, ironers, vacuum cleaners and other such appliances.

Executives should encourage those in the commercial departments of their companies, especially in the smaller communities, to intensify their work and thus increase sales of merchandise, which will not only bring a profit on the merchandise sold, but will bring greater revenue by increasing the minimum domestic bills.

Commercial Development Lags Behind

Many have wondered why the development of commercial activities has not kept apace with engineering progress in the industry. The desire to bring about economical production in order to meet increased costs has been only a small contributing cause to this situation. The engineer, because of his natural analytical tendencies, has studied and delved deeper into the subject of engineering than the commercial man has done

in the commercial field of our industry. The engineers also have carried on more intensive research work. The incandescent lamp, with its improvements over a period of years, which now supplies for a dollar an amount of light which in the late eighties cost fourteen dollars, is an example of this.

There is no reason why men in the commercial division cannot make as rapid strides as the engineers. Commercial men must delve deeper into their subject, make a more thorough study and analysis of their work and at their meetings and conferences work harder and play less. The right spirit was shown recently at a meeting of the Technical National Section of the N. E. L. A. held in Omaha. Officers of the association were asked what entertainment they desired, and the answer was: "We don't want entertainment of any kind. We came here to study and work."

Part Played in Public Relations

Moreover, those interested in the commercial field must take into consideration in the carrying on of their work the great importance of proper public relations and the development of public good will. Generally speaking, people deal with those in whom they have confidence. To obtain efficiency in carrying on our merchandise and commercial programs, we must make the people not only like us but really have business affection for us.

When the housewife comes to the door and is greeted by a sales representative of a power and light company, unconsciously she should feel that she is being met face to face by a friend—one in whom she has absolute confidence. It is not the individual but the company he represents which she thinks about. If she has confidence in the company, she will have an ear for his story and be influenced by what he says.

Through the sale of merchandise customers become more dependent upon the power and light company—that is, if the appliances are correctly sold and properly serviced. Every appliance brings convenience into the home and eliminates household drudgery. The institution supplying this service efficiently and "with a smile" cannot help profiting in the acquisition of good will by each and every transaction.

The carrying on of this program will bring home the message to the housewives of America suggested by Bruce Barton in his article entitled "How Long Shall a Wife Live?" In this way, also, by the sale of electrical merchandise to the housewife, a great deal can be accomplished in building up the off-peak load. There are many more ways, however, than domestic sales to build up this load.

Persons interested in the commercial field should study their load curve and develop commercial business which will take the valleys out of the charts. The best methods, at the present time, I believe, concern commercial and domestic refrigeration, industrial heating and the electric range. Butcher shops, grocery stores and restaurants—especially those that keep open all night—are good prospects in every city.

We must not lose sight of the fact that in increasing the off-peak load practically the only additional operating expense is coal cost, and coal is only a portion of production costs. Production costs are approximately only 20 per cent of our total cost of delivering electrical energy. By working our investment energetically during the 8,760 hours of every year we shall bring about quicker "turnover."

The average power and light company has a "turnover" of once in four or five years. If we worked our investment energetically and made the greatest use possible of our equipment, we could increase our gross so that we would earn a dollar a year on a three-dollar investment instead of a dollar on a four-dollar or five-dollar investment.

The commercial department of a power and light company can do a great deal in bringing this about by intensive study and by working out and carrying on a systematic merchandising and sales program. Analytic study by commercial men and increased interest on the part of operating executives will "do the job." Immediate steps should be taken by the 51 per cent of the power and light companies which do not now merchandise electrical appliances to install electric shops and obtain new business in other ways, in order to bring increased kilowatt-hour sales.

Every power and light company should have an efficient sales organization, an advertising department directed by some one who has made a study of advertising, and should obtain the advice and utilize the ability of a person who knows how to decorate and trim display windows properly and forcefully. This does not mean that the window trimmer must be on the full-time payroll, for there is some one in every community who has had experience in window trimming whose services can be obtained for part time.

Home Economics Department

In connection with the sales organization a home economics department should be operated. In this way women customers can be shown the best ways and means of getting 100 per cent efficiency from the appliances they purchase.

I feel the same as B. C. Forbes, who recently said that the people look to power and light companies as the logical electrical merchandisers, since the appliances purchased depend solely upon the electrical energy sold by the company. Since it is impossible to bring a situation about where the central station will be the sole electrical merchandiser in each community, commercial men of power and light companies should work in close co-operation with all agencies that sell electrical merchandise. This can be done by association in local electrical organization, by furnishing aid and advice in the arranging of window displays, by frequent conferences to discuss proper merchandise and merchandising methods, and by co-operative advertising. Working together in this way, it is inevitable that more sales of electrical appliances will be made and that the purchaser will receive a higher grade of service.

A check should be made of every house being built, and owners and contractors should be induced to install the necessary outlets for future electric appliances and usages. For example, many homes are being erected today without proper outlets to accommodate electric refrigeration. Steps should be taken immediately to remedy this.

We now have more than a financial interest in furnishing the people of America with electric service. Electricity has become so entwined with our every-day lives that we have a moral obligation as well—an obligation to give the people of this country every possible chance to avail themselves of the manifold aid and comfort that is afforded by the giant servant of man—Electricity.

A User's Appraisal of Electric Trucking

Difficult Transportation Problem in the Chicago Loop District Satisfactorily Solved with Electric Truck Fleet

BY LESTER M. BRANCH
Electric Truck Bureau, Commonwealth Edison Company, Chicago

BETTER and more economical delivery service have resulted from the adoption of electric trucks to replace horse-drawn vehicles by the firm of Hinckley & Schmitt, Inc., of Chicago, whose business is chiefly the sale and distribution of table and drinking water to stores and office buildings. A large part of the business consists of supplying drinking water to offices that rent water stands or coolers from the company. Virtually all of this class of service is located in the Loop district and calls for a distinctly short-haul type of trucking, for which the electric has been found more dependable and generally satisfactory than either the gasoline truck or horse-drawn vehicle.

Owing to the nature of its business, the company experiences its peak load during the summer months. During the hottest weather the demands on the company for service are the greatest, and it is at these times that efficiency and dependability of delivery equipment are of vital importance. These factors figured prominently in the failure of the horse to furnish satisfactory transportation.

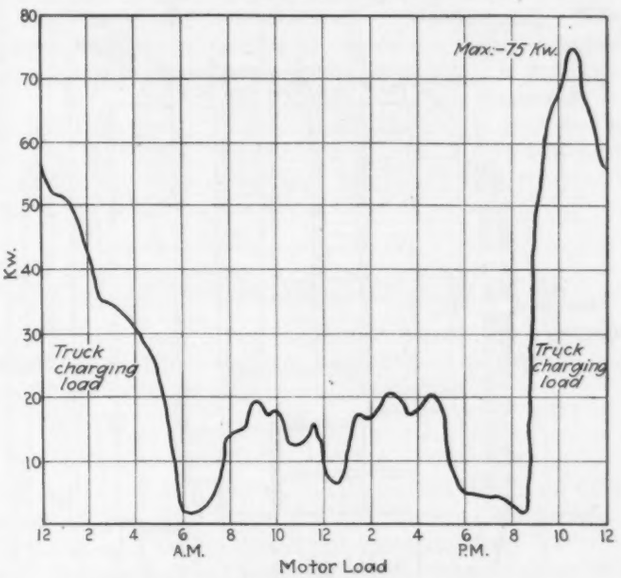
Before the advent of the motor truck Hinckley & Schmitt had between sixty and seventy horses in their delivery service. Their first step toward complete motorization was the purchase of gas trucks to displace horse and wagon units on long routes and they are at present operating a fleet of sixteen gas trucks, each on a one-trip route covering about 40 miles per day. These routes include deliveries to suburban districts where the stops are infrequent and where the trucks cover from 8 to 12 miles between the plant and the first and last stops of the route.

Gas trucks proved to be efficient and reliable on these longer routes, but they were not adapted for the work on the medium length and shorter routes. At the same time horse equipment was proving unsatisfactory.

In 1921 the company purchased its first electrics, six in number. These trucks displaced horses on routes of medium length and performed admirably. Two additional electric trucks purchased shortly after the first installation of six left only twenty-eight horses in the company's service, all of which were used in making deliveries to the Loop district.

In the latter part of 1923 the company added ten 3-ton electrics to the fleet, bringing the total to eighteen electric trucks, which, with sixteen gas trucks, comprise their present fleet. The last ten electrics purchased displaced all of the remaining horse and wagon equipment, twenty-eight horses and fourteen wagons.

According to Mr. Schmitt, these ten trucks have a capacity for work that exceeds by 50 per cent that of the horse and wagon equipment which they displaced and still have a reserve capable of delivering 25 per cent more work within a day than at present.



CURVE SHOWING RELATION OF BATTERY CHARGING AND MOTOR LOAD

Hinckley & Schmitt maintain an accurate and comprehensive record of costs and performance on this entire fleet. Records for the gas units are distinct from those for the electric units operating on medium routes and from those of the ten electric units used on Loop deliveries. Under this system comparative costs of individual units in any one of the three groups give an accurate picture of relative performance.

The data in Table I are taken from records kept for the ten electrics on Loop deliveries.

The operating cost of $1,378.67 is an average of the individual total annual costs of the ten Loop trucks. The items included in the individual totals are shown in Table II, which is the actual record of one of the ten trucks for the year 1924.

Horse-drawn delivery equipment has been advocated most strongly for very short-haul work with numerous stops, yet here is a company whose delivery work comes within that category, as its ten electric trucks deliver an average of 7.5 tons per day and travel less than 10 miles in the process. The total cost of operation for this so-called "typical horse work" averages $1,378.67 per truck per year, or $4.68 per day. In addition, the electric trucks replaced horses in nearly a one to three ratio, and their capacity for work exceeded that of the horse equipment they displaced by 50 per cent.

TABLE I—AVERAGE COST PER ELECTRIC TRUCK IN LOOP DISTRICT DURING YEAR 1924

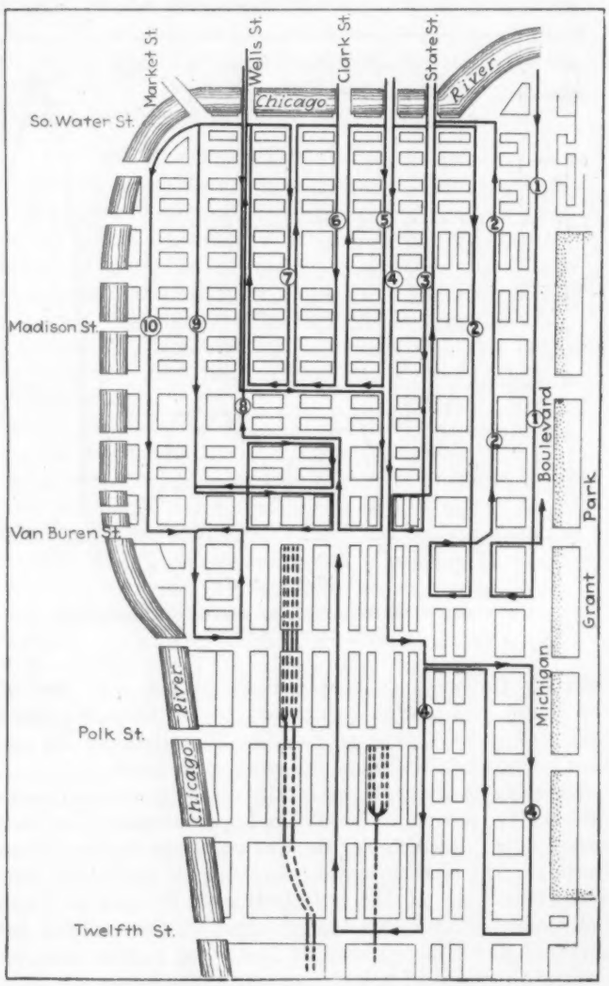
Number days operated	295
Miles covered	2,303
Pounds carried	4,611,240
Tons carried per day	7.5
Loads per day	2.5
Operating cost complete, year 1924	$1,378.67
Operating cost complete, per day	$4.67

TABLE II—INDIVIDUAL TRUCK-COST RECORD (JAN. 1, 1924–DEC. 31, 1924, TRUCK NO. 13)

	Per Year	Per Day
Fixed Expense:		
Rent at $9 per month	$108.00	$0.35
Insurance	125.00	.42
License and vehicle tax	52.50	.18
Depreciation on body and chassis at 20 per cent per year	531.00	1.80
Battery depreciation	276.00	.93
Variable Expense:		
General maintenance, including repairs to body and chassis parts	57.00	.19
Garage labor, including charging, washing, greasing and mechanical work	207.00	.73
Current	65.00	.22
Tires	56.70	.19
Grease and oil	6.00	.02
Total cost	$1,484.20	$5.03

Compare these costs with the cost per day of operating a team of horses. Barn rent charged on the same basis as on the electrics would equal $0.24 for wagon rent, $0.48 per team, or a total of $0.72. Insurance would equal $0.16 per day, wagon and harness depreciation $0.25, depreciation on team, $0.37, shoeing, $0.56 per team; barn labor, $0.80; wagon repairs, $0.33; hay, grain and bedding, $1.50.

The items listed above total $4.69 per day for one team of horses, more than the actual cost per electric truck doing one and one-half times as much work. In the team costs harness repairs, harness oil, grease,



MAP OF ROUTES COVERED TWO OR MORE TIMES DAILY BY TEN ELECTRIC TRUCKS. THIS WORK FORMERLY REQUIRED FOURTEEN TEAMS AND WAGONS

blankets, veterinary, taxes and miscellaneous costs have been omitted, yet the cost per team exceeds the cost per electric truck. As noted above, the average daily operating cost for the electric truck is $4.68 and for a team is $4.69. Since the electric truck's daily performance is one and one-half times that of the team, the true relative cost would be $4.68 $\times$ 1½, or $7.03 for the team and $4.68 for the truck.

The Commonwealth Edison Company, which supplies power to Hinckley & Schmitt, finds this charging load extremely desirable and profitable. As indicated in the accompanying diagram, this customer's battery charging load, which comes at off-peak hours, is several times as large as its industrial load.

Letters from Our Readers

Mr. Hansen Replies to Mr. Fynn

To the Editor of the ELECTRICAL WORLD:

Replying to the letter of Val A. Fynn in the August 15 issue of the ELECTRICAL WORLD, I did not offer a Heyland motor to the public in response to the request for a unity-power-factor motor officially broadcast by the N. E. L. A. on December 21, 1921, for the simple reason that I did not know that such a request had been made.

Furthermore, my feeling has been that the Heyland motor was proposed long before industrial conditions created a demand for it, and for that reason, and not because of any limitation of the motor, it has failed to become commercially adopted until recently. However, with changed conditions it is rapidly coming into its own. An interesting letter in the July 18 issue of the ELECTRICAL WORLD, by Dr. Fr. Kade, clearly states that this has been its fate in Europe. Mr. Fynn's sudden activity in behalf of a motor based on the same principle indicates that this will also be its fate in this country. Being convinced of its eventual success, provided the need for such a motor is sufficiently developed, and having at the present time no direct interest in the motor, there appears to be little reason for my offering it to the public.

Mr. Fynn asserts that an advance made by him over the theoretical machine of Heyland resulted in a commercial asynchronous unity-power-factor motor. A quotation from Dr. Kade's letter may prove of interest in this connection. He writes: "Later on two types of compensated asynchronous motors were designed. The first one (Bergmann, Berlin, spring 1923, Deutsche Werke and others) corresponds exactly to the old Heyland motor . . . Some thousands of both kinds of motors are in practical use throughout Germany."

It is evident that the "theoretical Heyland machine" is also a practical commercial unity-power-factor motor, even without the improvements which Mr. Fynn claims he has made.

I did not make the assertion that Mr. Fynn's new motor is in every detail identical with the Heyland motor. What I did say was that they can differ only in the particular method of impressing the voltage on the commutator. In the Bergmann motor, which Dr. Kade says corresponds exactly to the old Heyland motor, this voltage is obtained from an auxiliary winding placed in the stator slots and consisting of a few turns only, in some cases as low as one turn per phase per pole. Obviously, a number of methods may be used to obtain this voltage without departing from the principle of the Heyland motor.

Mr. Fynn long ago became convinced that a true solution of power-factor correction must be looked for in a non-synchronous machine. In the Heyland motor he had an excellent prototype to strengthen him in this conviction and guide him in his efforts to evolve such a motor. Yet for twenty years he has been investigating the possibilities of the synchronous induction motor and has devised some seven or eight types of synchronous machines for power-factor correction. I trust that it is not an unpardonable offense to feel puzzled over his stand on power-factor-corrective apparatus.

Milwaukee, Wis. K. L. HANSEN.

Central Station and Industrial Practice

Meters Used as Reverse-Current Relays

THE Charleston (S. C.) Consolidated Railway & Lighting Company experienced trouble at its "Five Mile Substation" with two rotary converters racing when the alternating-current voltage on the feeders supplying the converters was interrupted. Various mechanisms were tried to provide suitable protection against this condition, but without the desired success, due to the fact that they were not sufficiently sensitive to meet the requirements.

Finally, through the resourcefulness of R. C. Stevens, superintendent of the meter department, the trouble was remedied by the use of two Sangamo Type D-5 direct-current watt-hour meters arranged to act as reverse-current relays. The potential coils of the two meters were both connected across the main buses. The cables leading to the machines were spanned as shunts. The span on the one cable was used to form the armature connection for the one meter and the span on the other cable to form the armature connection for the other meter.

The trains were removed from the two meters and leads were brought from the trip coil of the no-voltage release attachments on the machine circuit breakers. Each coil was connected to special contacts placed inside the corresponding meter. One of the meter contacts was stationary and the other was mounted on the meter disk. A stop was also placed in the meter to prevent rotation in the direction opposite to the fixed contact.

When the rotaries are running at line voltage, they are delivering energy to the line and the meters attempt to run forward, but cannot, as the stop prevents them. If the voltage of one of the rotaries drops below the line voltage, there is a flow of energy back into the machine and the meter swings back the other way, closing the meter contacts and opening the circuit breaker by short-circuiting the no-voltage coil. This coil is in connection with a series resistor, which prevents a complete short circuit.

This arrangement has provided a most excellent type of direct-current time-limit reverse current relay and has never failed to operate.

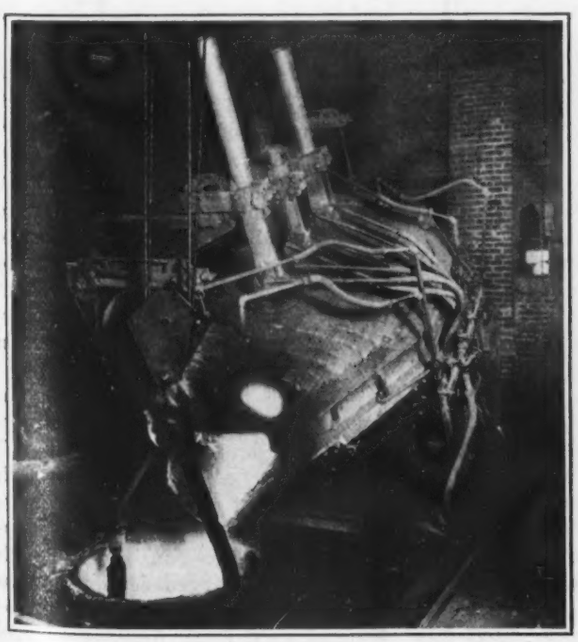
Electric Heat in Omaha Steel Works

Steel Castings from 97 per Cent Scrap—Electric Annealing Furnace Profitable Addition to Electric Steel Foundry—Operating Data on Melting and Annealing Furnaces

BY FORD BATES
Assistant Sales Manager Nebraska Power Company, Omaha, Neb.

THE installation of an electric annealing furnace in the electric steel foundry of the Omaha Steel Works has not only improved the quality of the castings produced by the foundry but has materially improved the load factor and power factor of the customer, making the foundry more profitable for both the owner and the power company.

Steel castings are produced in a 3-ton Ludlum, three-phase arc furnace of approximately 500 kw. rating at 64 volts. Operating on the basic process, the bottom lining of the furnace is made up of magnesite brick. Complete manufacture of the steel is carried out in the furnace itself. The furnace operates through two shifts per day, turning



THREE-TON LUDLUM ARC FURNACE POURING STEEL MADE FROM 97 PER CENT SCRAP

Car bottom, direct-heat furnace for annealing steel castings. Temperature, 1,600 deg. F. Weight of charge, 8 tons. Inside dimensions, 6½ ft. wide, 9 ft. deep, 3 ft. high. Connected load, 200 kw. at 220 volts.

out five 3-ton heats, or 15 tons of steel during the two shifts. The composition of a typical charge of steel melted at the Omaha Steel Works is shown in Table I.

TABLE I—COMPOSITION OF TYPICAL CHARGE FOR ELECTRIC STEEL FURNACE

Material	Lb. per Charge
Foundry scrap	1,600
Structural steel scrap	2,000
Foreign scrap	1,500
Pig iron	75
Iron ore	25
Ferromanganese	21
Ferrosilicon	43
Total weight of charge	5,264
Total weight of scrap	5,100
Per cent of scrap charged	97

To the above was added, to produce slag, 150 lb. of lime, 50 lb. of coke and 30 lb. of old electrode material.

As indicated in this table, electric steel castings may be produced from a charge consisting of 97 per cent scrap. The slag formed is utilized to introduce the proper amount of carbon into the final mixture. The first slag is removed during the heat and takes off with it phosphorus and other impurities. The carbon added to the slag permits building up the carbon content in the steel, just prior to pouring.

A considerable percentage of the steel produced at the Omaha Steel Works is used in railroad service and is made to comply with the railroad companies' specifications. In Table II are shown the general specifications to which steel is produced and on the right is shown the analysis of a particular sample, together with its tensile strength.

A general line of carbon steel castings used in special construction equipment, trailers and tractors is also produced. For this class of work the carbon content is generally controlled between 0.20 per cent and 0.30 per cent.

The arc furnace uses an average of 650 kw.-hr. per ton of metal charged. With an average daily production of 15 tons of steel, the arc furnace uses approximately 10,000 kw.-hr. per day and approximately 250,000 kw.-hr. per month, with a maximum demand of approximately 650 kva. Annealing of the steel castings is now carried out in a 200-kw. resistance type furnace, operating at 220 volts, three-phase, 60 cycles.

TABLE II—GENERAL SPECIFICATIONS OF STEEL

General Specifications		Test Samples	
Element	Per Cent	Element	Per Cent
Carbon	0.25	Carbon	0.37
Phosphorus	.05 or less	Manganese	.70
Sulphur	.05 or less	Phosphorus	.022
Manganese	.70 or less	Sulphur	.028
Silicon	.35 or less	Tensile strength	90,225 Lb. per Sq.In.
		Specified strength	65,000

A charge of from 6 tons to 8 tons is placed on a car and pushed into the furnace, the furnace door closed and sealed with sand and the current turned on. The furnace and charge are brought up together to a temperature of 1,600 deg. F. in ten hours and held at that temperature for two hours. At the end of twelve hours the current is cut off and the furnace allowed to cool to 800 deg. F., when the charge is withdrawn and allowed to cool in the air.

The furnace is at present supplied with only 6 tons of castings per day and operates during one shift only, remaining idle a large percentage of the time. The present energy consumption of the furnace is approximately 300 kw.-hr. per ton of metal annealed. With the increased production and more continuous operation, this energy consumption is expected to fall to 200 kw.-hr. per ton of metal annealed.

The production of the steel foundry has increased since the installation of the electric furnace and power equipment and the quality has materially improved since the installation of the annealing furnace. Because of this increase in production and greater uniformity and improved quality of product, the foundry is now undergoing an expansion to nearly three times its former capacity. This expansion of productive equipment carries with it a considerable increase in the power load.

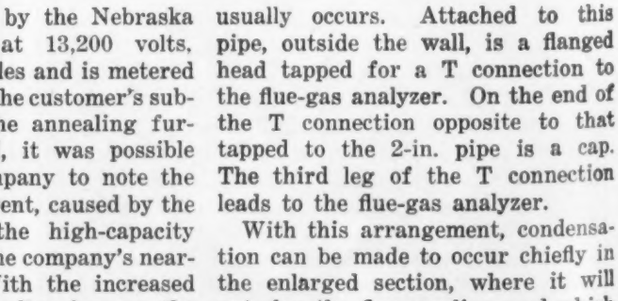
All power for the Omaha Steel Works is supplied by the Nebraska Power Company at 13,200 volts, three-phase, 60 cycles and is metered at 13,200 volts, in the customer's substation. Before the annealing furnace was installed, it was possible for the power company to note the fluctuations in current, caused by the arc furnace on the high-capacity feeder line out of the company's nearest substation. With the increased load due to the annealing furnace, the fluctuations of current caused by the arc furnace are a smaller percentage of the total current in the line, and further, because of the high power factor of the annealing furnace, the power factor of the line itself has been raised, with the result that the character of the customer's entire load has materially improved. The increased load factor, energy consumption and revenue of this customer have placed it in a class with the other large and important power users of the Nebraska Power Company.

Overcoming Flue-Gas Sampling Trouble

By W. G. Shurgar
Superintendent of Power Station Arkansas Central Power Company, Little Rock, Ark.

When long stretches of small-diameter continuous flue-gas sampling pipes are exposed to radiation, condensation of the gases within has been known to corrode the pipes and aggravate clogging thereof. A calcium-chloride drier in the pipe-line will absorb moisture reaching it, but will not prevent condensation in the sampling pipe where it passes through the boiler setting.

At the power plant of the Arkansas Central Power Company, therefore, another precaution has been taken that has proved very effective. Just inside the furnace wall each ¾-in. sampling pipe is fastened to a ¾-in. to 2-in. reducer, which in turn is fastened to 2-in. pipe running through the boiler setting, where most of the condensation usually occurs. Attached to this pipe, outside the wall, is a flanged head tapped for a T connection to the flue-gas analyzer. On the end of the T connection opposite to that tapped to the 2-in. pipe is a cap. The third leg of the T connection leads to the flue-gas analyzer.

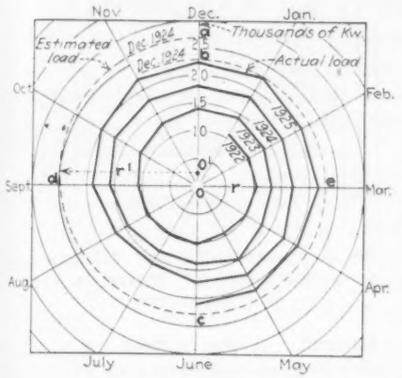


MODIFICATION OF FLUE-GAS SAMPLING PIPE TO REDUCE PITTING AND CLOGGING

With this arrangement, condensation can be made to occur chiefly in the enlarged section, where it will not clog the flue-gas line, and which can be readily replaced. By removing the cap on the T connection, obstructions in the ¾-in. pipe on each side of the enlarged section can be poked out. Since making these changes in flue-gas lines no trouble of the nature previously mentioned has been experienced.

Graphic Load Check

A CLOSE RECORD of load on a transformer station is important. A graphic method for showing load conditions on such stations has been developed by engineers of the Hydro-Electric Power Commission of Ontario. As shown on the accompanying chart, the actual and estimated loads on the station are shown



METHOD OF COMPARING PEAK LOADS OVER A NUMBER OF MONTHS

for a series of years and for each month in the year.

The chart is made up as follows: Assuming *ob* represents the transformer station capacity in December, 1924, a half circle is drawn as shown by dashed line *bec* with radius *r*. The distance *ba* is laid off as the estimated increase in load on the station for December, 1925. Then twenty-minute peak demands on the station are plotted for each month from December to June, 1924, on radial lines. The resultant curve shows at a glance the relation of load to station capacity at any time. For the second half of the year 1924 the semicircle *cda* is drawn with a radius *r'* and center *o'*. The offset distance *oo'* represents one-half the distance *ba*. Actual peak loads are then plotted on the radial monthly lines, and the resultant graph of actual load against estimated load affords data for an interesting study of station capacity and load conditions.

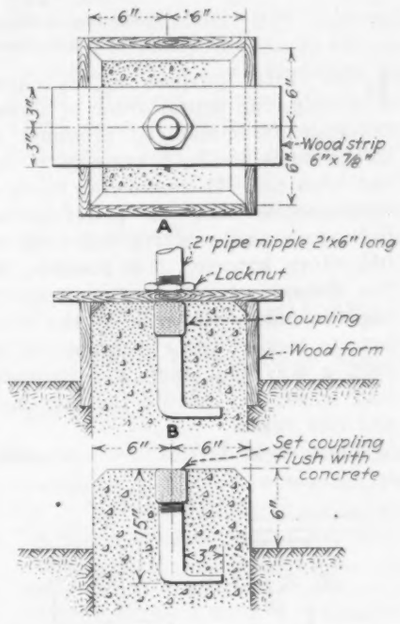
Installing Pipe Inserts in Concrete Foundations

BY E. J. AMBERG

Electrical Engineer Connecticut Light & Power Company, Waterbury, Conn.

IN UTILIZING pipe framing for bus structures in outdoor substations, the Connecticut Light & Power Company, Waterbury, employs the following method of fastening the pipe uprights to the foundation, instead of using a flange attached to the concrete with bolts. Increased rigidity and strength are thus obtained.

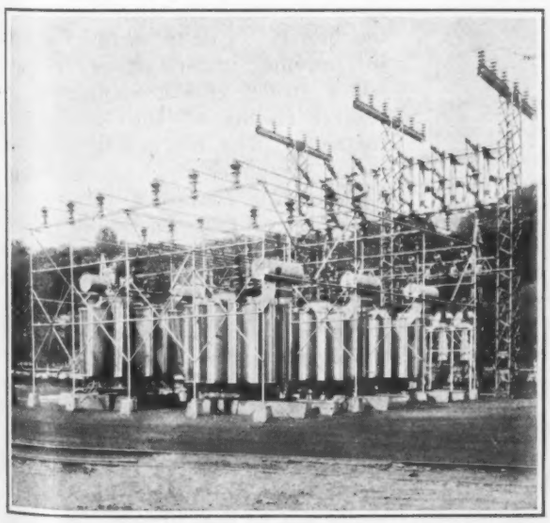
After the forms for the pipe foundation are put in place, a piece of pipe about 18 in. long is flattened out and bent to a right angle for about 3 in. at one end, the other end being threaded and fitted with a coupling. The piece is then placed in the form so that the top of the coupling is flush with the top of the form. A strip of wood bored to pass over the pipe is then placed over the form. Next, a section of pipe about 30 in. long is threaded and a lock nut screwed upon the thread, after which the pipe section is run through the hole in the board and screwed into the coupling already in the form. The lock nut is then tightened and a level is placed on the 30-in. pipe section in order to insure its being

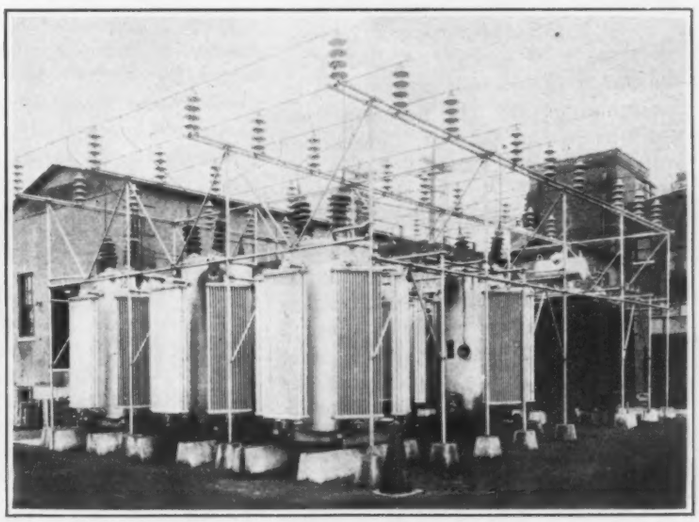


METHOD OF FASTENING PIPE UPRIGHT TO FOUNDATIONS

A—Plan of form and wooden cap strip.
B—Cross-section of form and pipe insert.
C—Completed insert ready for upright attachment.

plumb. The concrete is then poured, and when set, the 30-in. piece is unscrewed and the forms are removed. There remains a perfect pipe insert all ready to receive the permanent uprights for the bus structure.





TWO TYPICAL INSTALLATIONS USING PIPE CONSTRUCTION

At left, two transformer banks at Waterbury supplied from a 66-kv. double bus mounted on high steel towers at rear, to obtain clearance. The pipe structure carries 66-kv. and 13.2-kv. buses above the transformers and is braced to insure adequate rigidity. At right, with slight changes, readily made in the pipe structure, a 10,000-kva. transformer bank (shown dark, at the rear) was installed in space formerly occupied by a 5,000-kva. bank. At the front are two 5,000-kva. banks. Over these banks is a 66-kv. bus and the secondaries connect with a 2,300-volt substation bus through cables.

Determining the Sequence of Phases

Simple Tests for Checking the Correct Connections of Instruments Such as Power-Factor Indicators and Reactive Volt-Ampere Indicators

BY JOHN AUCHINCLOSS

Switchboard Engineering Department,
General Electric Company, Schenectady, N. Y.

FOR THE purpose of synchronizing, the actual order of phase sequence is immaterial provided it is the same on both systems to be synchronized. In connecting certain instruments, such as power-factor indicators and reactive volt-ampere indicators, however, it is possible, in the absence of information regarding the phase sequence of the system, to connect these instruments in such a way that they will indicate lead when they should indicate lag, and vice versa.

When such devices are connected

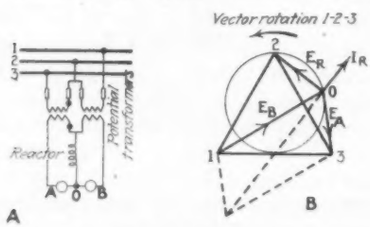


FIG. 1—METHOD OF DETERMINING PHASE SEQUENCE

directly in the circuit of a synchronous motor, the correctness of the direction of deflection may be checked by increasing the field strength of the machine and noting if the pointer tends to move toward the side of the scale marked "lead." If it does so, the connections are correct; if it moves toward the side marked "lag," the potential connections to studs marked *A* and *D* on the power-factor indicator should be interchanged and the potential connections to the coils of the reactive volt-ampere indicator should be reversed.

The connections shown on the switchboard wiring diagram are based on a vector sequence in the order 1-2-3—that is, phase 2 reaches a maximum after phase 1, phase 3 after phase 2, and phase 1 after phase 3, and if the sequence of the system is in the same order, the instrument should give the correct deflection when connected in accordance with the diagram.

When the instrument is not connected to a synchronous motor, the sequence of the system may be readily determined by the method shown in Fig. 1. The reactor may be a coil of any kind having a reactance approximating the resistance of the lamps.

Due to the presence of the reactor, the lamps will glow with unequal brilliancy depending upon the sequence of the phases. For example, suppose lamp *B* is brighter than lamp *A*, then the voltage E_B across lamp *B* must be greater than the voltage E_A across lamp A, and the junction point, *O*, will fall on the right half of the circle (Fig. 2A).

Since the currents in the lamps are in phase with the voltages E_B and E_A, they will also meet at the point *O* and the current in the reactor will have the phase I_R. The voltage across the reactor will be the voltage E_R from *O* to the upper corner of the triangle. Since we know that the voltage across a reactor leads the current flowing in it by 90 deg., it is evident that the vector rotation is in the direction shown by the arrow and the vector sequence is in the order 1-2-3.

If, however, lamp *A* should be the brighter, then the point *O* would fall on the left half of the circle, as shown in Fig. 2B, and the current through the reactor would lie to the left of the reactor voltage, indicating a phase rotation opposite to that shown in Fig. 1B, and in the vector sequence 3-2-1.

Should the vector sequence of the system be found opposite to that on which the switchboard diagram connections are based, the connections to the studs marked *A* and *D* on the power-factor indicator should be interchanged, and the connections to

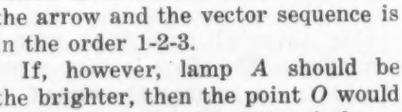


FIG. 2—CHECKING PHASE SEQUENCE OF INSTRUMENTS

the potential coils of the reactive volt-ampere indicator should be reversed.

A very simple check on the direction of deflection of a power-factor indicator is shown in Fig. 3. The instrument should be connected as shown and a short-circuiting wire connected across the coil and to the current transformer. If this short circuit causes the needle to deflect towards the "lag" side of the scale, the potential connections are correct. On the other hand, should it cause a deflection toward the "lead" side, the potential connections to the studs marked *A* and *D* should be interchanged. After correct connections have been obtained the short-circuiting wire should be moved.

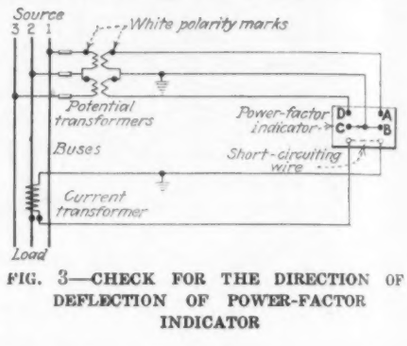


FIG. 3—CHECK FOR THE DIRECTION OF DEFLECTION OF POWER-FACTOR INDICATOR

Preventing Direct-Current Motors from Sparking

THE Lehigh Valley Coal Company has adopted a method of starting small direct-current motors used for driving portable mine pumps that has eliminated the necessity of throwing these motors directly on the line, which usually causes spitting and arcing at the brushes. To do this GE CR-3171-6 type protective panels were rewired as follows:

One contactor is used to open and close the shunt field, the other to open and close the positive line to the motor. A snap switch is used to provide under-voltage release, which, when closed, completes the control circuit of the shunt field contactor. The interlock on this contactor completes the control circuit for the line contactor. The short time interval between the closing of the shunt field and the motor line by this method of wiring allows the shunt field to build up and eliminates most of the sparking when the motor is thrown on the line.

A resistor tube is connected across the contact tips of the shunt field contactor. This tube is shorted while the motor is running but, when the motor stops, allows a small amount of current to flow through the shunt field, keeping the motor dry. The slight heating of the resistor tube prevents the accumulation of moisture inside the inclosing case when the motor is not running.

Commercial Activities and Public Relations

Dealers and Central Station Join in Range Sale

UNDER an intensive load-building campaign launched July 1, the Pacific Gas & Electric Company plans to sell 4,000 electric ranges, 2,000 electric water heaters and 4,000 electric air heaters within the ensuing six months.

The policy of the company will be to continue its present plan of dealer co-operation and to maintain list prices. To encourage more sales of ranges by dealers the company has extended the following liberal plan of participation:

A discount of 25 per cent off list price. No overhead expense incurred by dealers, as the company carries the time payments for the range and the wiring.

Dealers may sell any of the makes of ranges handled by the company, the company acting as the jobber.

A flat installation price of $54 cash and $60 on time in cities and $34 cash and $40 on time in other territory.

If the sale is to be turned over to the power company, the dealer collects 20 per cent of the installed price of the range at the time the sale is made, turns this over to the company and receives in return 20 per cent of the list price of the range as commission. However, the dealer may carry his own time payments if he wishes and make his own terms.

The dealer enjoys the benefits of the power company's advertising and cooking demonstrations.

Electrical dealers and department stores, household furnishing stores and hardware stores, etc., who have complained in the past of insufficient margin on the electric range, will be given a most liberal discount to encourage their active support to the campaign, providing they display five ranges, one water heater and one air heater. Such display will be provided by the power company.

The Pacific Gas & Electric Company has employed a large number of salesmen and will sell ranges and water heaters direct to consumers. Sales will be made by house-to-house solicitation by men working on a salary and commission basis. Where a salesman and a dealer both have the same prospect, the salesman will receive a commission regardless of whether he makes the sale or the dealer makes it. This is to prevent salesmen trying to take prospects away from dealers.

All district offices of the company throughout central and northern California are now active. During the first day of the campaign the Sacramento district sold sixty-one ranges. A policy similar to the one outlined has been inaugurated by the Great Western Power Company, which serves very largely the same territory. This company has set a quota of 2,000 ranges and 1,000 water heaters to be sold during the next six months.

Employees Sell 1,676 Fireless Cookers

Women's Division, Nebraska Power Company, Enlists Sales Ability of All Employees to Add a Total of 1,100 Kw. in Heating Appliance Load

JANITORS, stenographers, linemen, clerks, engineers, laborers and executives proved successful salesmen in disposing of 1,676 electric cookers in a twenty-nine-day employees' sales campaign, conducted by the Nebraska Power Company, Omaha, Neb.

In order that this campaign would be entirely in the hands of the employees and not the sales department, K. P. Goewey, sales manager of the Nebraska Power Company, drafted a plan placing the entire responsibility for the success on the shoulders of the women's division. Conferences were held and committees appointed from the women's organization, consisting of a general and several subcommittees. Policy, advertising, terms, commissions and prizes were decided by these committees. In this way more than seventy women employees of the company learned the details of a selling campaign and are justly proud of their endeavors.

The general plan was as follows:

The company was divided into thirteen groups of approximately equal size.

A captain was appointed to supervise the work of each group.

All details of each group were handled and supervised by the captains.

The first down payment by the customer was made to the employee selling the cooker. The employee then turned the order and down payment over to the captain.

One dollar in commission was paid for every cooker sold.

The commissions were paid weekly by check.

The cookers were delivered direct by the company to the customers.

A special committee of the women's division handled all the details, record keeping, and kept count of all money and orders.

Before the campaign opened, liter-

A STRIKING SIGN INCREASED THE DRAWING POWER OF THE COOKER WINDOW

ature describing the cookers was distributed to the employees. Advertisements clipped from the newspapers were posted in various places about the company's properties. A miniature newspaper was published each week, telling of the plan and

COOL COOKING
Excel Electric Cooker
Operates from A Light Socket
Cool Cooking
All heat is kept within the cooker. No radiation. Your kitchen stays cool.
Cooks Everything
It roasts, bakes, fries and boils. Prepare an entire meal at the same time.
Economical
Costs but 3c an hour to operate. Cook the food half done, turn off the current and it finishes cooking without cost.
Utensils
Consists of one container, two aluminum kettles, a rack and a four-foot electric cord.
75c
DOWN
50c Per Month
Sale Price $6.75
"Electric Shops"
15th and Putnam Sts. 2314 M St. 43d and Leavenworth Sts.
Nebraska Power Co.
COURTESY—SERVICE—LOW RATES

NEWSPAPER ADVERTISING IS INDISPENSABLE IN THIS TYPE OF CAMPAIGN

the activities of the campaign, and was mailed direct to the employees' home addresses.

On the first day of the campaign more than two hundred cookers were sold. Day by day the total began to mount. The original quota of 1,000 cookers was passed during the first two weeks. When 1,300 cookers had been sold, a special effort was made to sell 1,500. Enthusiasm was kept high by the keen competition in each of the groups. Each group posted its totals day by day, so that every employee could see what his fellow employee had sold.

The final compilation was a grand total of 1,676 cookers sold. Employees outside of the electric shops sold 923 and 753 were sold in the electric shops. Of the total sold by the employees outside of the shops, 254 were sold by the women and 669 by the men.

A janitor in the office building won the first prize commission honors by selling fifty cookers. Second honors went to a stenographer. She sold forty-eight cookers. Third commission money was paid to a young man in the adjustment department who sold thirty-seven cookers.

POWER REQUIREMENTS OF ELECTRIC MILKING MACHINES ON SEVEN DAIRIES, DAVIS, CAL.

February to April, 1925

Dairy No.	No. of Units	No. Cows per Unit	No. of Cows	Amount of Milk per Cow per Day (Lb.)	Energy per Day per Cow (Kw.-Hr.)	Energy per Day per 100 Lb. Milk (Kw.-Hr.)	Energy Cost per Cow per Month	Average Milking Time per Cow per Day (Min.)	Energy Cost per 100 Lb. Milk* (Cents)
2	10 D	42	420	20.6	0.033	0.15	$0.02	10.38	$0.32
6	2 D	60	120	18.5	0.050	0.27	0.032	.....	0.54
7	2 D	43	86	19.2	0.038	0.198	0.023	8.406	0.396
1	4 S	12	48	22.7	0.075	0.33	0.043	12.09	0.66
3	2 D	19	38	22.6	0.0816	0.36	0.048	12.76	0.72
5	2 S	14	28	23.8	0.112	0.47	0.066	.....	0.96
4	1 D	20	20	29.0	0.145	0.50	0.087	15.34	1.00
Average	....	..	..	23.2	0.076	0.327	0.0455	11.795	....

* Assuming a power cost of 2 cents per kilowatt-hour, which is about the average rate paid.

Many employees sold in the neighborhood of twenty-five cookers. The most gratifying thing of the entire campaign was that nearly every employee in the company, including executives, sold at least one cooker.

Since the close of the campaign, additional orders have been turned in by employees that have increased the final sales to date to more than 2,000 cookers, making a total additional appliance load of 1,100 kw.

The Nebraska Power Company will continue the practice outlined here, and now that employees understand the plan more fully and have gained confidence that they can sell and make extra money, company executives look forward to increased appliance sales from this comparatively new source.

Making Indianapolis a Better Lighted City

THE Merchants Heat & Light Company of Indianapolis, which is installing more than 4,000 General Electric lighting units in the city's new street-lighting system, lets the people know that the work is for the benefit of Indianapolis by placing a large sign on each new pole in a position close to the ground where it is sure to be noticed.

Unit Consumptions for Electric Milking

ENERGY CONSUMPTION of electric-milking machines on seven typical farms in the vicinity of Davis, Cal., has been studied by the California committee on relation of electricity to agriculture and the data presented in the table above. These figures must be taken as preliminary, as the experiment is still in progress. Dairy herds studied ranged from 20 to 420 cows, with an average daily milk production from 18½ lb. to 29 lb. per cow. It will be noticed from the data that the energy required varies from 0.033 kw.-hr. per day per cow to 0.145 kw.-hr. per day per cow and that the cost of production varies from 0.32 cent to 1 cent per hundred pounds. The highest electric cost per cow per month was less than 10 cents and the average less than 5 cents.

The data have been arranged in the order of the size of herd, starting with the largest, and it will be seen that the cost gradually increases as the size of the herd decreases. The energy for the smallest herd, of twenty cows, costs about three times that for the largest herd, of 420.

The average time required for milking was 11.7 minutes per cow per day. This time is affected by other factors besides the milking units, such as the number of milkings per day, the individual care given the cows and preparatory precautions, such as washing and drying the udders.

Following Up Commercial Cooking Prospects

AS A PART of its sales and educational effort to extend the use of electricity for commercial heat applications in Cleveland, the Cleveland Electric Illuminating Company has recently issued a booklet entitled "Commercial Cooking with Elec-

tricity." It is being distributed especially to restaurateurs, bakers, hotel men and club stewards before whom representatives of the Cleveland company have presented the advantages of electric cooking. The booklet affords a pictorial tour through some of Cleveland's commercial kitchens that are equipped with electricity. In addition it illustrates some electric appliances available for commercial cooking and baking, giving characteristics thereof. To indicate the reception already given electric operation a partial list of diversified establishments using electrical appliances is presented along with terse comments on some advantages of electric cooking. At the end of the booklet the Cleveland Electric Illuminating Company offers to assist any interested consumer in the solution of his problems, upon receiving a telephone call.

Organized Lighting Exhibits

BY ERNEST J. TEBERG
Lighting Sales Engineer Public Service Company of Northern Illinois, Chicago

THE Public Service Company of Northern Illinois has been active in the development of electrical leagues throughout its territory and has recently completed a five-weeks lighting exhibit and lecture campaign with the assistance of local electrical leagues in five cities of northern Illinois. The campaign produced very satisfactory results at low cost, the direct expense for any one of the exhibits not exceeding $185.

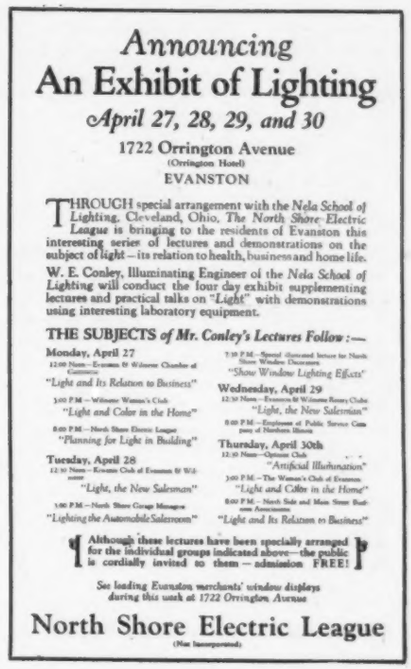
Exhibits were held in Evanston, Waukegan, Oak Park, Chicago Heights and Pontiac, Ill. Each exhibit and lecture-demonstration included: (1) A modern show-window installation, the equipment being installed by the company and the displays being furnished by the merchants of the community. The show-window display continued for two weeks in each city; (2) lecture-demonstrations of good practice in interior lightings for homes, stores, schools and factories, carried out in a lecture room, generally in the same building with the window display, and supplemented by lectures before high school students; (3) advertising to assure attendance at the exhibits and lecture-demonstration. Lectures and demonstrations were held during four days of each week, one week being spent in each city. The schedule of lectures followed in each city was: Forenoon, lectures for high school students and business men's organizations, generally combined with a luncheon; afternoon, for special groups such as women's organizations; evening, for electrical contractor-dealers and company employees. The lectures were given by W. E. Conley, illuminating engineer of the Nela School of Lighting.

Supplementing the lectures and demonstrations, pamphlets describing good lighting were furnished those attending. Two one-quarter page ads were run in the local newspaper and direct-by-mail advertising, consisting principally of letters, was used to secure attendance at the lectures.

During the four days that the lectures were given in Evanston, 700 high school students attended and 300 merchants, electrical contractor-dealers and public utility employees were instructed in the methods used and results to be expected in applying modern lighting practice.

In this exhibit, at Chicago Heights, the show window was trimmed with a display of millinery from a store located across the street. Six hats constituted the display and four of these were sold the first night the window was lighted, the remaining two being sold the following morning. The hats had previously been displayed in the windows of the millinery store for a week without a sale. The storekeeper was so pleased with the result that the electrical league was asked to furnish an entire new layout for relighting the millinery store.

Although the Public Service Company initiated the exhibits, it enlisted the co-operation of all electrical interests of the communities, with the result that equipment, publicity and substantial support were obtained at very low cost considering the successful results. The cost of one of the exhibits was as follows: Newspaper advertising, $80; direct-by-mail advertising, $20; installing fixtures and show-window equipment, $30; rental of chairs, $20; luncheons for Chamber of Commerce, $35; total, $185.



Announcing
An Exhibit of Lighting
April 27, 28, 29, and 30
1722 Orrington Avenue
(Orrington Hotel)
EVANSTON

THROUGH special arrangement with the *Nela School of Lighting*, Cleveland, Ohio, *The North Shore Electric League* is bringing to the residents of Evanston this interesting series of lectures and demonstrations on the subject of light—its relation to health, business and home life.

W. E. Conley, Illuminating Engineer of the *Nela School of Lighting* will conduct the four day exhibit supplementing lectures and practical talks on "Light" with demonstrations using interesting laboratory equipment.

THE SUBJECTS *of Mr. Conley's Lectures Follow:*—

Monday, April 27
12:00 Noon—Evanston & Wilmette Chamber of Commerce
"Light and Its Relation to Business"
3:00 P.M.—Wilmette Women's Club
"Light and Color in the Home"
8:00 P.M.—North Shore Electric League
"Planning for Light in Building"

Tuesday, April 28
12:30 Noon—Kiwanis Club of Evanston & Wilmette
"Light, the New Salesman"
1:00 P.M.—North Shore Garage Managers
"Lighting the Automobile Salesroom"
7:30 P.M.—Special illustrated lecture for North Shore Window Dressers
"Show Window Lighting Effects"

Wednesday, April 29
12:30 Noon—Evanston & Wilmette Rotary Clubs
"Light, the New Salesman"
8:00 P.M.—Employees of Public Service Company of Northern Illinois

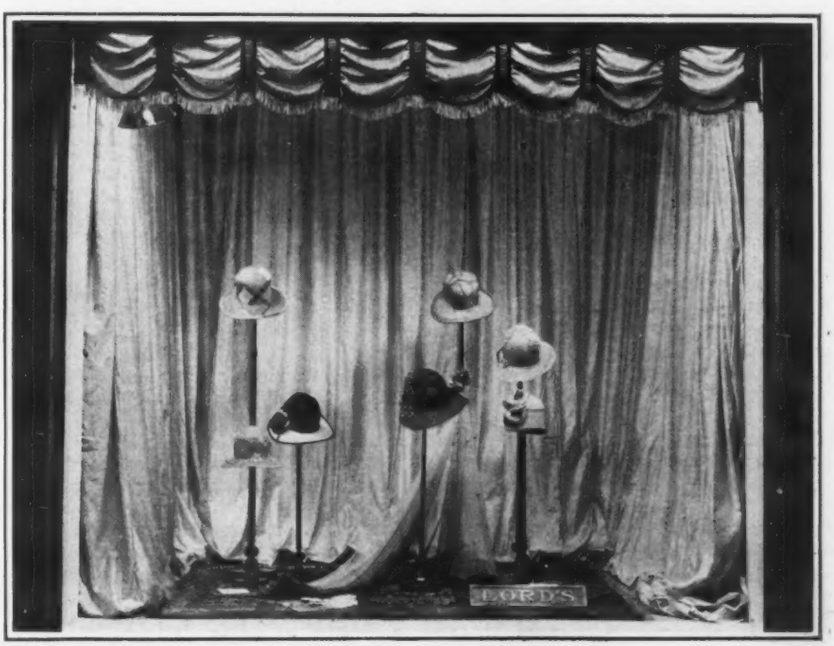
Thursday, April 30th
12:30 Noon—Optimist Club
"Artificial Illumination"
3:00 P.M.—The Women's Club of Evanston
"Light and Color in the Home"
8:00 P.M.—North Side and Main Street Business Associations
"Light and Its Relation to Business"

Although these lectures have been specially arranged for the individual groups indicated above—the public is cordially invited to them—admission FREE!

See leading Evanston merchants' window displays during this week at 1722 Orrington Avenue

North Shore Electric League
(Not Incorporated)

NEWSPAPER ANNOUNCEMENT OF LIGHTING EXHIBIT



NEW WINDOW LIGHTING EQUIPMENT THAT SOLD SIX HATS IN TWENTY-FOUR HOURS

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Thermal Gain Results from Resuperheating.—W. E. BLOWNEY and G. B. WARREN.—The information and data in this article were obtained from a paper on "The Increase in Thermal Efficiency Due to Resuperheating in Steam Turbines" presented before the annual meeting of the A. S. M. E., of which an abstract was recently given in the Digest.—*Power Plant Engineering*, July 1, 1925.

Radiation in the Pulverized-Fuel Furnace.—W. J. WOHLENBERG and D. G. MORROW.—This is an analytical paper in which the subject is attacked from the theoretical side. It is shown that the radiating power through the flame surface depends primarily on the size of the particle and that, based on the flame-surface area, its magnitude relative to black radiation is low. The heat-absorption intensity at the cold surface, however, may be considerably higher than the relative radiance of the flame. Sample calculations and appendices of the original paper, presented at the spring meeting of the A. S. M. E., are omitted.—*Mechanical Engineering*, August, 1925.

Trenton Channel Plant of the Detroit Edison Company.—C. F. HIRSHFELD.—This plant is planned for an ultimate capacity of 300,000 kw. In addition to the description of the plant itself, with maps and diagrams, the paper gives reasons for the adoption of various features, one of them a set of Cottrell precipitators for the removal of most of the ash from the stacks because of its location close to a fine residential district. Practically all motor-driven equipment in the boiler-house is driven by adjustable-speed direct-current motors, as are the larger turbine-house auxiliaries. A list of such equipment is given. An abstract of other points brought out at the presentation of the paper may be found in the report of the spring convention of the A. I. E. E. in the ELECTRICAL WORLD for April 25, 1925, on page 862.—*Journal of A. I. E. E.*, July, 1925.

Generation, Control, Switching and Protection

Initial and Sustained Short Circuits in Synchronous Machines.—VLADIMIR KARAPETOFF.—The instantaneous values of armature and field currents, when an alternator is short-circuited, determine the rating of protective apparatus, mechanical stresses in the machine itself, possible damage to other equipment, etc. During the first few cycles, after a short circuit the currents are usually much larger than those on sustained short circuit and gradually approach the latter values. Formulas are deduced in this paper for both. The treatment is analytical, starting with an unsymmetrical three-phase winding with an external inductance in one of the phases, for which the Kirchoff equations are set up. The general solution is then applied to various cases. A reference to this paper is made in the report of the A. I. E. E. spring convention in the ELECTRICAL WORLD, April 25, 1925, on page 864.—*Journal of A. I. E. E.*, August, 1925.

Single-Phase Short-Circuit Calculations.—W. W. LEWIS.—*Calculations of Short-Circuit Ground Currents on Three-Phase Power Networks, Using the Method of Symmetrical Co-ordinates.*—SADATOSHI BEKKU.—Both of these articles deal with the calculation of currents caused by single-phase short-circuits on three-phase networks. The first-named gives several methods that are especially useful with comparatively simple networks, equations being set up and numerical solutions being worked out for illustrative problems. In the other article a method is developed that is most advantageous where power is fed into the network at many points. This method permits the use of the calculating table developed for the computation of three-phase short circuits.—*General Electric Review*, July, 1925.

Units, Measurements and Instruments

New Balancing Machine.—H. HORT.—Large high-speed rotating members of machines, such as turbine-blade wheels, armatures and rotors of turbo-generators and motors, must be carefully balanced to avoid eccentricity. Various dynamic balancing machines are available for this surpose, but it has been recognized that a dynamic test alone does not suffice and that it should be augmented by a static test in addition. The Krupp works have developed a new balancing machine for a combined dynamic and static test, for which a number of advantages are claimed. The rotor does not run in closed bearings but on edged rolls. The tests are made with rising speed, eliminating any danger of explosion. Only one-half of the usual dynamic test has to be made; the remainder is accomplished statically. Two models are available—one for rotors up to 1,500 kg., the larger type for rotors up to 120 tons. A full theoretical account of the principles of this new machine is given.—*Elektrotechnische Zeitschrift*, July 16, 1925.

Vibration Recorder for Pathological Analyses.—CHESTER I. HALL.—The device consists essentially of a small concentrated-filament lamp, the rays passing through a condensing lens and falling on a hemispherical mirror of 12.5-mil radius attached to the finger of a patient whose tremors are to be observed. By an optical system the vertical and horizontal components of the motion of the mirror, which constitutes in effect a point source of light corresponding to the center of the hemisphere, are recorded on a moving film. Charts of typical pathological tremors and other movements are reproduced. The instrument is applicable to the study of various kinds of mechanical vibration. A reference to this paper may be found in the ELECTRICAL WORLD report of the A. I. E. E. spring convention, April 25, 1925, on page 863.—*Journal of A. I. E. E.*, August, 1925.

Transmission, Substations and Distribution

Charts for Regulation of Transformers.—ARTHUR A. BOELSTERLI.—It is assumed that either by tests or by computation the ohmic and reactive drops are available. The purpose of the paper is to provide a method of ascertaining the regulation at any desired power factor with less labor than is involved in numerical computation. Two methods are shown. In the first part of the paper charts are presented from which the results can be read. In the second part a simple "chord diagram" is developed which is well suited for approximate estimates. The use of each is shown by illustrative examples. Since the vector diagram for a transformer is similar to that for a transmission line when electrostatic capacity is ignored, the methods are equally applicable to the latter. The definition of regulation on which the charts are based is that of the A. I. E. E. standards.—*Journal of I. E. E.* (*England*), July, 1925.

Motor-Generator Sets.—J. BELLAIGUE—To the urban supply system of Paris were added recently eight new 3,000-kw. motor-generator sets to change the incoming 12,000-volt, two-phase current into 550-volt direct current. These sets are built by a French firm and represent a radical departure from the customary motor-generator type for this kind of service. Four machines are placed on one shaft—that is, a direct-current dynamo, a synchronous motor, a synchronized asynchronous starting motor and an exciter. Units 2 and 3 are built closely together, and the stator of unit 3 can be shifted circumferentially in relation to its rotor so as to get the exact position required for synchronous run. This synchronized asynchronous motor has an output of 280 hp. and requires for its start only 20 per cent of the rated current of the main motor. It synchronizes automatically, thus simplifying the start to a mere closing of a switch and running the starter handle to its end position. The exciter feeds first this special motor and during normal run the main motor. From standstill to full run the sets require only two and one-half minutes. The motor-generator set weighs 95,000 kg.—*Revue Générale de l'Electricité*, July 11, 1925.

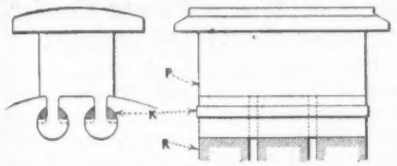
Heat Applications and Material Handling

Electric Heating of Car-Wheel Tires.—A. E. MÜLLER.—Employing the transformer principle, a French concern is manufacturing three standard models of wheel-tire heaters, for which a number of advantages are claimed over the customary methods of heating such tires by a coal fire or gas. A small transformer core with a primary winding on the lower yoke has a readily removable upper yoke with magnetic butt joints, the tire being placed over one of the vertical legs, and represents

one short-circuited secondary turn of the transformer. A tire of 230 lb. weight and 28-in. inside diameter can be thus heated within twenty-five minutes to 210 deg. C., whereby its diameter increases $\frac{1}{16}$ in. The primary winding consumes 20 kva., or 5.4 kw.-hr. at an average power factor of 59 per cent.—*Elektrotechnische Zeitschrift*, July 9, 1925.

Motors and Control

High-Speed Rotor Design.—This new design of rotors for high-speed synchronous machines with salient poles permits of an unusually secure fastening of poles to the rotor spider. Each pole carries at its underside two or more semi-circular, under-cut ribs, which engage with similarly shaped grooves in the spider periphery. Two long properly shaped wedges anchor each pole in its slots. In the accompanying illustrations *R* designates the spider, *P* the pole and *K* the wedges. It is claimed that this method of fastening the poles will safely withstand 100 per cent overspeed. Test rotors subjected to such overspeed showed upon



ROTOR FOR HIGH-SPEED SYNCHRONOUS MACHINES

subsequent dismantling no signs of excessive stress on wedges or grooves. It is also claimed that this method calls for a very gradual change in the cross-section diminishing of the rotor spider at the places where the poles engage, so that a very high mechanical safety factor results.—*Bulletin Oerlikon*, May, 1925.

Electrophysics, Electrochemistry and Batteries

Short-Length Tungsten Arc Characteristics.—S. H. ANDERSON and G. G. KRETCHMAR.—The characteristics here referred to were determined for gap lengths ranging from 0.005 mm. to 0.4 mm. and are therefore of interest in connection with the use of tungsten contacts in ignition or relay circuits. Oscillograms of the arc current and voltage were taken as the electrodes (4 mm. in diameter) were uniformly separated by means of a cam connected to the oscillograph drum shaft. A thermionic tube relay was used to actuate the voltage element so that no current was diverted from the arc. The arc characteristics for constant length are shown in the figure. It was found that: (1) For an arc length of 0.4 mm. and for shorter gaps where the current is 4 amp. or more the characteristics are expressed by Nottingham's equation $E = A + B/i^n$ where $i = 1.49$; (2) the value of n fits roughly the linear relation of n to the absolute temperature of the boiling point of the anode material, as suggested by Steinmetz; (3) the minimal length characteristic is expressed by $E = 13.2 + 1.05 / (i - 1.75)$, which makes it possible to compute the constants of a circuit so as to eliminate sparking between tungsten contact points.— *Physical Review*, July, 1925.

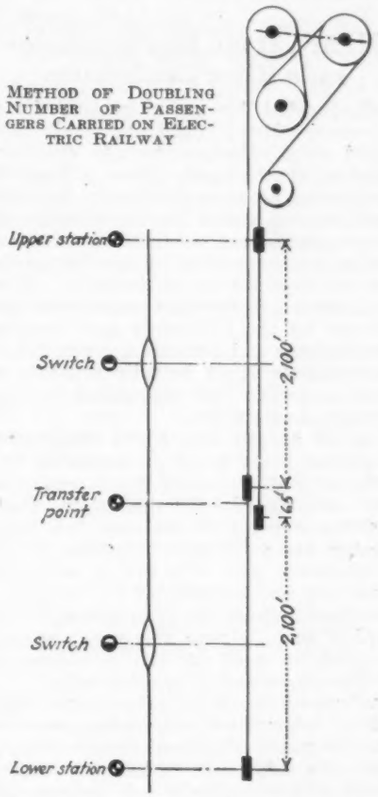
Electrical Properties of Circuits Containing Semi-Conductors.—O. R. RANDALL.—The semi-conductors investigated were materials like stone and unglazed porcelain. It has been known for some time that large electrostatic forces apparently exist between the surface of such a material and a good conductor when an electrical pressure is established across the contact. Experiments were conducted with a view to determining how the conditions at the contact were affected by area, polarity, aging and temperature and to investigate the properties of the material itself. It was found that an increase in the area of the negative contact was much more effective in decreasing the apparent resistance of the circuit than a similar increase in the positive. The conduction seems to be electrolytic in nature. For a description of the experiments and the author's conclusions reference should be made to the original.—*World Power*, July, 1925.

Traction

Southern Railway's New Rolling Stock.—Rolling stock for the recently electrified sections of the Southern Railway (England) consists of three-car units, one trailer between two motor-cars, and during the busy period of the day two of these units are joined, with the further addition of a two-coach trailer unit. Motor cars are 58 ft. long, trailers 60 ft. After the English fashion each is divided into a number of compartments—operator's, baggage and seven passenger compartments on the motor and nine passenger compartments on the trailer, two or three of these being first-class. The article gives dimensions, describes construction and materials and shows illustrations.—*Engineer* (*England*), July 10, 1925.

Mountain Railways.—D. WINKLER.—To facilitate and to modernize the transportation of iron ores and of the crews on the Erzberg mountain in Austria two new electric roads have been installed. The iron ore is brought down from the mountain over a cog railway with a 5 per cent inclination, the train consisting of one four-motor locomotive and ten cars. The weight of the loaded train is 114 tons. The output of the 500-volt direct-current locomotive is 150 hp. The weight of the empty train going up the mountain is 40 tons. Using a recuperative braking method, the entire system does not require any external electrical energy. The down-grade loaded train sends about 90 kw. into the overhead line, which is more than ample to pull the empty train uphill. To transport the crew 4,265 ft. up the mountain a 61 per cent inclined cable railway has been installed. The novel feature of this installation is the double arrangement of cars. To double the number of persons hauled in a given time without doubling the speed or increasing the size of the car, a transfer point has been established at a point half way up the incline, and two cars are pulled up together in series, one from the bottom station up to the middle and the other one from the middle to the top. On the other end of the rope descend, at the same time, one car from the top to the middle and one from the middle to the bottom. The passengers change cars at the middle station (see illustration). An additional advantage of

METHOD OF DOUBLING NUMBER OF PASSENGERS CARRIED ON ELECTRIC RAILWAY



this system is the much more favorable equilibrium of the two cables, the ratio being 1 to 1.85.—*Elektrotechnik und Maschinenbau*, July 12, 1925.

Telegraphy, Telephony, Radio and Signals

Long-Distance Radio Receiving Measurements in 1924.—L. W. AUSTIN.—Two stations, Monte Grande (LPZ), Argentina, and Cayey (NAU), Porto Rico, have been added during the year to the number of those of which the received signal strength is regularly measured in Washington. The former is 2,000 km. farther away than the European stations and the waves travel in a south-north direction and encounter entirely seasonal conditions different from those encountered between Europe and America. Mean monthly values of field intensities of signals from the various stations and of the corresponding atmospheric disturbances are shown in tables and curves. Some comparisons of these quantities are also given for the years 1922, 1923 and 1924. In addition, measurements were made in August and September at San Diego, Cal., on signals from Cavite, P. I., and Malabar, Java. These gave opportunity to secure data on all-daylight and approximately all-water transmission for distance of 6,400 and 8,000 nautical miles. The observed average field intensities have between two and three times the values as computed by the Austin-Cohen formula.—*Proceedings I. R. E.*, June, 1925.

News of the Industry

Hunt's Stand Disrupts Colorado River Conference

Confronted by an ultimatum from Governor Hunt outlining Arizona's stand with reference to any development of the Colorado River, a tristate conference between California, Nevada and Arizona, called for the purpose of discussing the mutual interests of those states, broke up after its opening meeting at Phoenix on August 17. The conference was between committees appointed by the California and Nevada Legislatures and a committee appointed by Governor Hunt to take precedence over a similar body appointed by the Arizona Legislature.

In his speech before the conference Governor Hunt made an extended attack on the Colorado River compact and enunciated the principle that Arizona expects to become the proprietor state of any Colorado River development and "to derive revenue from any development of the river in whatever manner the laws devise." He implied that Arizona was experiencing no pressing need for the development of the river and is willing to retard development until the other states are willing to purchase water and power or until the needs of Arizona dictate action.

In the meantime the upper basin states had tentatively set August 27 as the date for a meeting at Denver of representatives of Utah, Colorado, Wyoming and New Mexico for the purpose of coming to some agreement whereby the resources of the stream may be utilized.

Spectacular Illumination for San Francisco's Jubilee

San Francisco will be a blaze of glory during the "Diamond Jubilee" which will be held September 5 to 12 in honor of the seventy-fifth anniversary of California's admission to the Union. The plans for spectacular lighting at the coming jubilee are even more elaborate than those that attracted world-wide attention to the Golden Gate City at the time of the Panama-Pacific Exposition. More than $100,000 will be spent on this feature of the celebration.

Two radio panchromatic fountains will interpret broadcast music in motion and color; the City Hall plaza will be floodlighted and will be topped with an "aurora borealis"; cartouche and banner-bearing standards will line the streets, and streamers of lights will be strung along the "Path of Gold," or Market Street. A jeweled arch containing 40,000 "Novagem" jewels will be erected at the approach to the City Hall plaza; flambeau standards bearing flaming torches will be erected at the entrances to the city; trees and shrubbery will be adorned with incandescent lamps, and Chinatown will be decorated with lighting standards of an Oriental design.

The spectacular illumination has been designed by the illuminating engineering laboratory of the General Electric Company, under the direction of W. D'A. Ryan.

Proposal to Use Muscle Shoals at Once to Combat Drought

To meet the shortage of power in the Southeast, which is so acute as to require limitations of street-car service and part-time operation of factories, a proposal has been made to the Chief of Engineers of the army that generator tests be started at the Muscle Shoals government plant on the head now available. Ex-Senator Dial of South Carolina, a member of the President's commission, is urging the plan. The pool behind the dam is standing at 490 ft. above sea level—11 ft. below the operating level. The Chief of Engineers on August 24 reiterated his conviction that no more water should be impounded until the Tennessee River shows a gage at Florence of —0.7. The gage on that date read —1.6.

There now is line capacity sufficient to take away 85,000 kw. from Muscle Shoals. The steam plant is producing 60,000 kw., its maximum capacity. If the generators were tested with the present head, they could be operated at about 50 per cent capacity. The lines now available could handle the part-capacity output of two generators in addition to the output of the steam plant. This would be of very great moment to the consumers in the South at this time.

The auxiliary turbine which furnishes the power at the Wilson Dam for operations on the dam itself has been tested. This is the first unit of the structure actually to produce power.

Southern Power Company Curtails Service

Low water resulting from the drought has forced the Southern Power Company, in common with other hydro-electric producers in the Southeast, to curtail the use of power for industrial purposes. The Southern Power's retrenchment program began this week and will continue until the condition is relieved by rains. Letters announcing the cut and the plans for making it effective have been mailed from the Charlotte (N. C.) offices of the company to all consumers. The territory served by the company is divided into five districts and each district is asked to close down one day each week. A similar plan was followed by the power company during the drought period of two years ago and was found to be very effective, securing practically 100 per cent co-operation. Most of the hydro-electric plants of the company are on the Catawba River. From the first of last February to the present time the rainfall in the basin of this river has been less than 45 per cent of the average for the past five years.

The curtailment in the use of power will affect 300 textile mills in the Piedmont section of North and South Carolina, operating more than five million spindles. However, many of these mills have been operating on a part-time basis for several months on account of unfavorable market conditions.

The drought is said to be the worst the section has experienced in thirty-five years and streams are virtually dried up.

Difficulties of the Georgia companies and their retrenchment plans were referred to in the ELECTRICAL WORLD last week (page 379).

Plan of World Power Conference Quarterly Journal

The quarterly journal which, as reported last week, the World Power Conference will publish for one year as an experiment, is to carry, in addition to original material, abstracts of important articles pertaining to power which have been published in the various countries. Any article, before it will be considered by the editorial staff, must have the approval of the national committee in the country of its origin. The national committees also are to furnish statistical information and reports of progress. Provision also is made for the publication of special articles by experts in the various countries, for which payment will be made. Articles are to be in the language of the country of origin, but comprehensive synopses will appear in English, French, German and Italian.

Advertising in the periodical is to be confined to classified directories. Circulation will not be through the usual trade channels, but through the national committee of each country, which will arrange circulation as it desires.

H. A. Wagner Deprecates Inflation of Utility Stocks

Herbert A. Wagner, president of the Consolidated Gas, Electric Light & Power Company of Baltimore, has added his voice to those of other central-station executives who see the need for preaching restraint and conservatism in the matter of public utility stocks and the sensational rise made by some of them on the stock market. Mr. Wagner said the other day:

"While it is true that utility earnings have shown greater stability than those of perhaps any other industry, a strong factor in creating and maintaining this stability has been the state commission regulation of the earnings and security issues of these utilities. This stabilizing factor or any other stabilizing influence must act to prevent inflation as well as recession in

real market values, else it would not be stabilization.

"The regulation of public utility earnings has reached a basis where such utilities cannot expect to earn more than 8 per cent return on the values of their properties, and the regulation of security issues is tending rapidly to place these issues on a close parity with the actual property values. Earnings materially in excess of those allowed must inevitably be, and have been, followed by rate reductions.

"The stocks of sound public utilities are good investment stocks, but from their very nature as to stability and limitations as to dividends they should sell as investment stocks and not as speculative stocks. Good and well-seasoned utility stocks may reasonably sell on a 6 per cent basis. A stock paying 8 per cent dividends would in such case sell at approximately $133 per share. In considering no-par utility stocks the same fundamental conditions exist and the same controlling factors and limitations apply to both.

"Those responsible for the operation and progress of public utilities are faced with the necessity of almost continuously seeking additional capital for extensions through the issue of additional securities. In such financing they greatly prefer to interest the people in their own communities. This home interest brings with it the responsibility of protecting in so far as possible such investments of the people against unwarranted inflation and speculation."

Southern Edison Company's New Line

Work on the Third Link from Big Creek to Los Angeles Will Begin Next Week—To Cost $11,000,000—Details of Contracts for Material

ON SEPTEMBER 1 the advance guard of an army of eight hundred construction men will begin building the third 220,000-volt transmission line between the Big Creek-San Joaquin River power houses of the Southern California Edison Company and the city of Los Angeles, covering a distance of 231 miles at a cost of approximately $11,000,000. The electrical carrying capacity of the new line will be 200,000 hp.

This new transmission line will begin carrying power from the High Sierras to southern and central California by January 1, 1927. The industrial survey of the Edison-served territory commenced by R. H. Ballard, executive vice-president and general manager, several years ago shows that the time has arrived to prepare for the year 1927. July, 1925, showed an increase of more than 148,000 hp. for lighting, industrial expansion and agriculture, as against July, 1924.

More than 80 miles of road in addition to the existing highways will have to be built by the Southern California Edison Company to enable it to deliver the material to the tower sites along the line. These roads will be turned over to the public after they have served their purpose of carrying approximately 8,500 tons of material and supplies. Their construction and the large amount of blasting over the mountain regions will require the purchase of more than 50 tons of blasting powder.

Permanent and portable abodes numbering from two hundred and fifty to three hundred will be established for the working force. Labor will cost $3,000,000 in wages alone. The transportation of the men and of 8,500 tons of material will require large additions to the company's present automotive equipment. Road building equipment is scheduled as a separate item, consisting of tractors, road graders, road plows, etc.

As the new line will traverse territory 10 miles to 30 miles from the existing lines, an entirely new communication system will be built which will be 300 miles in length, requiring 9,000 poles, 1,200 miles (or 316,000 lb.) of copper wire, 10,000 cross-arms and 40,000 insulators.

Very important to the service of the community and its permanent development is the item of $3,244,000 for additions to the substations at Eagle Rock on the north side of Los Angeles and Laguna Bell on the east side, these two stations being at the receiving ends of the two load centers of industrial southern California. In addition to this expenditure $750,000 will be necessary for switching stations, one at Magunden in the San Joaquin Valley, half way between the generating stations and Los Angeles, and the other at Cresenta, the terminus of the new line.

While the work of constructing this new transmission line is in progress activities in tunnel construction and power-house building will be going on simultaneously on the Big Creek-San Joaquin River project of the company.

CONTRACTS FOR MATERIAL

Contracts for towers, conductors and insulators for the new line have been awarded. The tower contract was divided between the Pacific Coast Steel Company, San Francisco, and the Newport News Shipbuilding & Dry Dock Company, Newport News, Va. Conductors will be supplied by the Aluminum Company of America, Pittsburgh. Insulators will be furnished by the Westinghouse High-Voltage Insulator Company, Emeryville, Cal.

The contract for conductors calls for 680 miles of 1,033,500-circ.mil concentrically stranded steel-reinforced cable, consisting of seven central strands of steel and fifty-four strands of aluminum. This cable will weigh approximately 7,030 lb. per mile of wire and will have an outside diameter of 1.247 in. Deliveries are to be in four equal portions, the first to be made the latter part of the present year and the last early in 1927. The 50,000 insulators will be of the Westinghouse No. 632 high-strength, non-interchangeable type. On suspension towers single strings of insulators will be used; on canyon crossing and dead-end towers double-yoke strings are specified.

Ohio Edison Company to Build New Station

Construction of a power station at the confluence of Buck Creek and Mad River, near Springfield, Ohio, is to be begun on January 1 next by the Ohio Edison Company, according to an announcement just made by C. I. Weaver, vice-president and general manager. The company, which has headquarters at Springfield and serves twenty-eight central and southern Ohio communities, will spend about $1,800,000 on the project.

The plant will consist of three main sections, the boiler section, turbo-generator section and condensing section. It will require in normal operation more than 100,000,000 gal. of water a day for steam making and condensing purposes and will be capable of developing more than 135,000 hp. The first unit of the plant will, it is expected, be completely installed by midsummer of 1927.

Merger of Three Georgia Companies Under Way

A contract to purchase the properties of the Georgia-Alabama Power Company and the South Georgia Public Service Company, both with headquarters at Albany, Ga., has, it is reported, been signed by the Columbus Electric & Power Company of Georgia, which is under the management of Stone & Webster, Inc. These companies serve a score or more of cities and towns in southwestern Georgia and in Alabama, including Albany, Cordele, Americus and Tifton, Ga., and Eufaula and Enterprise, Ala. The Georgia-Alabama, from which the South Georgia Public Service buys its energy, has four steam and five hydro plants with a total rating of about 15,000 hp.

New Power Rate in Oregon

By an order of the Oregon Public Service Commission which became effective August 20 a reduced rate for industrial power has gone into effect in Portland. For customers guaranteeing a minimum of 4,000 hp. consumption the new rate will be $27 per horsepower a year. The reduction was made at the instance of the Portland Chamber of Commerce, which is actively interested in encouraging large industries to locate in Oregon, and executives of the light and power companies affected are quoted as predicting the success of the experiment.

The new rate differs in two essential particulars from the company's present power schedules: First, delivery must be in large single blocks (4,000 hp. or more) and from the company's transmission lines, thus relieving the company of distribution expense; second, the consumer must use a large block over long hours per day.

Prospects Good for Diamond Creek

Everything Points to Authorization of Long-Delayed Colorado River Project in October—Applications Before Commission from Missouri, California and Other States

ALL indications are that the Federal Power Commission will withhold no longer than its meeting on October 20 the issuance of a license for the Girand project at Diamond Creek on the Colorado River. So far as can be learned in Washington, nothing can be said at this time in opposition to the project that was not said at previous hearings in this case, which has been hanging fire for so prolonged a period. Apparently it is the disposition of the members of the commission to temporize no longer with the opposition to a project which means a great deal toward the development of the resources of Arizona. It is understood that Mr. Girand plans to transfer the license to a company which will draw its main support from the Arizona copper producers.

PRELIMINARY PERMITS SOUGHT

The Missouri Hydro-Elecric Power Company of Kansas City has applied to the commission for a preliminary permit covering a project on Eleven Point River and tributaries near Alton, Van Buren and Doniphan. The principal dam is to be in Eleven Point River, 5 miles below the Arkansas-Missouri line. There a head of 100 ft. will be developed. A diversion dam will be built below the source of Greer Spring with a flume to Eleven Point River, where a head of 75 ft. is available. It is estimated that 800 sec.-ft. will be available 90 per cent of the time for the 100-ft. head and 200 sec.-ft. for the 75-ft. head.

The Roanoke River Power Company of Richmond, Va., has applied for a preliminary permit covering a project on the Roanoke River near Clarksville. It is proposed to erect a dam 50 ft. high. The spillway crest is to be 1,500 ft. long. Four 12,500-hp. waterwheels are to be installed.

Swayne, Leland & Turner, San Francisco, have applied to the Federal Power Commission for a preliminary permit covering a power project on Jameson Creek and its tributaries in Plumas County, Cal. The project is near the towns of Johnsville and Blairsden. It is proposed to construct four reservoirs drawing water from Eureka Lake, Deer Creek and Poplar Creek. A ditch and flume will carry the water 4,600 ft. from Deer Creek to Eureka Lake, thence through an iron pipe to power house No. 1. Eureka Lake stores 2,600 acre-feet. Reservoirs A, B and C store 4,800 acre-feet. Power plant No. 2 will be in Jameson City and will operate under a head of 426 ft. Power plant No. 3 has a head of 416 ft. The total primary power which this development would make available is 5,195 hp., which would be for public utility use.

LINE TO CROSS ALLEGHENY FOREST

The Keystone Power Corporation of Pittsburgh has applied for a license covering a transmission line from a power house on Clarion River near Piney, Pa., to the Keystone company's substation near Ridgway, thence to the substation of the Penn Public Service Company near Warren. The line crosses the Allegheny National Forest.

Monroe City, Utah, has applied for a license covering a proposed auxiliary plant to be constructed on Monroe Creek near an existing municipal plant. Only 147 hp. of primary power is available. It is planned to make emergency use only of the proposed development.

A license for ten years has been issued the Buchen & Heinen Packing Company covering a project on Lower Lake on Baronoff Island, Alaska. The power is to be used for operating a fishery and fertilizer manufacturing plant.

Lighting Service Interrupted When Railway Plant Burns

A generator explosion in the plant of the Lake Shore Electric Railway Company at Avon, Ohio, on August 23 resulted in a fire which destroyed the plant, causing a loss of $250,000. A dozen or more villages extending along the shores of Lake Erie for about 40 miles depended on the plant for their lighting service and were thrown into darkness. Interurban cars were tied up. Energetic steps to restore power were at once taken and by the following night the Ohio Public Service Company's Edgewater station at Lorain was tied in and service to all the communities affected was resumed.

Pennsylvania Electric Association Arranges Program

Assembling at Bedford Springs once more for its eighteenth annual convention, the Pennsylvania Electric Association (Eastern Geographic Division, N. E. L. A.) will, on September 9 to 12, carry out the well-arranged program of which the main features follow:

THURSDAY, SEPTEMBER 10

Morning.—President's address, G. M. Gadsby; "The General Outlook," M. H. Aylesworth; reports.

Afternoon.—Review of the year's work of Technical Section, Norman G. Reinicker; address, Farley Osgood, past president A. I. E. E.; remarks by Col. William Kelly, director of engineering, N. E. L. A.; first-aid contest and presentation of Gadsby cup to winning team.

Evening.—Public policy meeting, E. L. Smith, chairman; addresses by President J. E. Davidson of the N. E. L. A., H. Hobart Porter and Commissioner W. D. B. Ainey.

FRIDAY, SEPTEMBER 11

Morning.—Reports of officers and committees; review of the year's work of Accounting Section, John F. Ford; "The Accountant's Place in Public Utility Operation," Dr. John T. Madden, New York University; review of the year's work of Public Relations Section, Charles Penrose; address, Major J. S. S. Richardson, director Pennsylvania Public Service Information Committee; "The Electric Industry and the Banker," F. E. Frothingham, Boston; report of women's public information committee, Miss Clara Zillessen; report of Information Bureau organization committee, J. H. Shearer.

Afternoon.—Review of the year's work of Commercial Section, M. E. Skinner; "How to Sell Electrical Merchandise," Edgar Kaufmann, Pittsburgh; symposium on rural electrification: F. P. Willits, Secretary of Agriculture of Pennsylvania, Commissioner John L. Stewart, P. H. Dewey, M. T. Phillips, Prof. R. U. Blassingame, R. H. Rogers, E. A. White and C. E. Oakes; special session for women: Review of the year's work, Miss Zillessen; "Activities of the Women Reflected in the Growth of the Utility," Mrs. J. H. Shearer.

SATURDAY, SEPTEMBER 12

Morning.—General session: Reports and election of officers.

Secretary Refuses Opinion

Dr. Work Will Not Give Views on Legality of Hetch Hetchy Contract—All Four Units at Work

NO OPINION upon the validity of the contract made between the city of San Francisco and the Pacific Gas & Electric Company for the distribution of power from the Moccasin plant of the Hetch Hetchy project is forthcoming from Secretary of the Interior Work, to whom the city referred the agreement in an endeavor to elicit a statement that it did not interfere with the Raker law, the United States statute under which the plant was built. In a letter written to James Rolph, Jr., Mayor of San Francisco, Secretary Work says:

"The act approved December 19, 1913 (38 Statutes 242), does not require the Secretary of the Interior to approve or disapprove contracts such as the contract entered into between the city and county of San Francisco and the Pacific Gas & Electric Company, dated July 1, 1925.

"It is the duty of the city and county of San Francisco at all times to comply with and observe on its part all the conditions specified in this act, and it is the duty of the Secretary of the Interior, in the event that the conditions specified in the act are not reasonably complied with and carried out, to report the facts, after notifying the city and county of San Francisco in writing, to the Attorney-General for such suits or proceedings in the proper courts as the law and the facts in his opinion warrant. The Secretary should not act at this time, but must await such development of facts as will enable the Secretary to determine with a certainty whether or not this act is being reasonably carried out by the city and county of San Francisco."

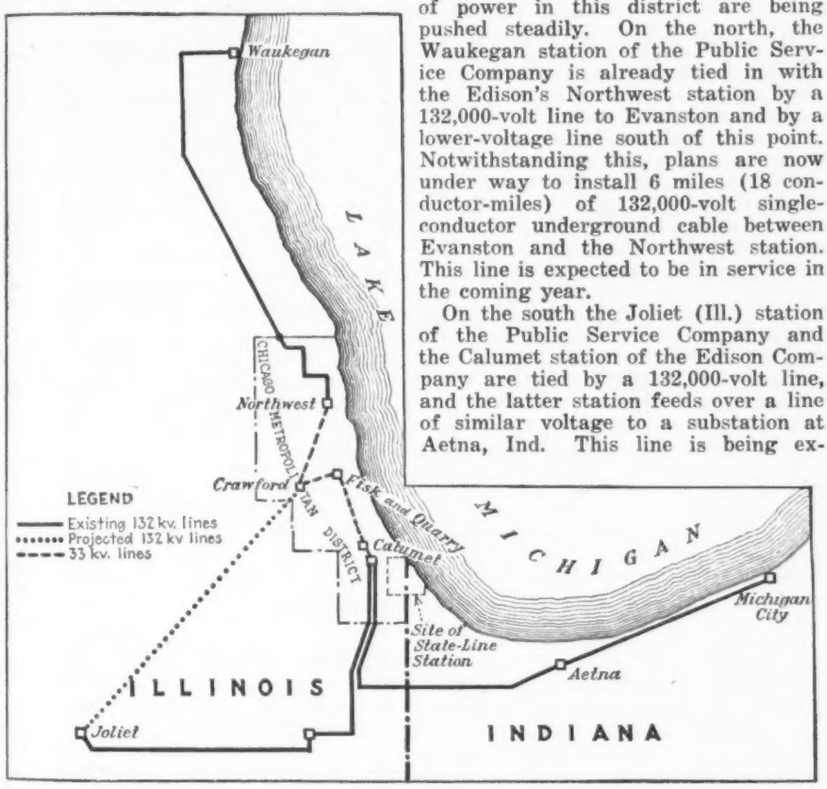
The plant, which, as reported in the ELECTRICAL WORLD for July 11 (page 81), was shut down on account of damage to two of the penstock lines caused by an operating error on June 30, began delivery of power from one unit to the Pacific Gas & Electric Company on August 14. Announcement now is made that all four generating units are in operation.

Immediately following the announcement that power was being delivered by the city of San Francisco from the Moccasin plant to the power company the Modesto and Turlock irrigation districts petitioned the Secretary of the Interior to cancel the grant made to the city under the Raker act on the ground that such delivery constituted a violation of the act.

Insull System Expands in Lake Territory

Recent Acquisitions and Contemplated Additions to Generating and Transmitting Plants Make Possible the Pooling of Energy in This District

PLANS laid by the Insull companies operating in the Great Lakes territory for development of an electric power pool in this area are rapidly progressing. A 75,000-kw. turbo-generator has been ordered as the third unit for the new Crawford Avenue station of the Commonwealth Edison Company to bring the installed rating there up to 235,000 kw. A 50,000-kw. unit has been ordered for the Waukegan (Ill.) station of the Public Service Company of Northern Illinois to bring that station up to 110,000 kw. Two 25,000-kw. units will, it is expected, be ordered soon for the projected Michigan City (Ind.) station of the Midland Utilities Company, unless the projected generating station at the Indiana-Illinois state line on Lake Michigan is started first. Owing to the fact that the state-line site is strategically situated for a development which may involve units of 100,000 kw. or even larger ones, it is probable that the Michigan City station, which is closer to the territory requiring increases in power facilities and which will be supplied with smaller units of a standard type, will be started first and completed in about two years. Preliminary plans have been completed, however, for the state-line plant and ground is being filled in preparatory to construction.



EXISTING AND PLANNED 132,000-VOLT DEVELOPMENT AROUND CHICAGO

These various plans will permit an increase of 272,500 kw. in generating stations in the Chicago metropolitan district in the next five years. The present capacity of the Commonwealth Edison Company is 884,500 kw. and that of the Public Service Company of Northern Illinois 186,715 kw. Operating subsidiaries of the Midland Utilities Company have a capacity of 118,600 kw., of which their own stations account for 43,350 kw. and interconnections for the remaining 75,250 kw. In addition there is 31,000 kw. available in plants of the Indiana Service Corporation just acquired by the Midland Utilities Company.

Plans for the still more efficient and economical production and distribution of power in this district are being pushed steadily. On the north, the Waukegan station of the Public Service Company is already tied in with the Edison's Northwest station by a 132,000-volt line to Evanston and by a lower-voltage line south of this point. Notwithstanding this, plans are now under way to install 6 miles (18 conductor-miles) of 132,000-volt single-conductor underground cable between Evanston and the Northwest station. This line is expected to be in service in the coming year.

On the south the Joliet (Ill.) station of the Public Service Company and the Calumet station of the Edison Company are tied by a 132,000-volt line, and the latter station feeds over a line of similar voltage to a substation at Aetna, Ind. This line is being extended to Michigan City and is expected to be in operation by fall.

Preliminary plans for the construction of a 132-000-volt line from the Crawford Avenue station to Joliet over a route to the southwest of Chicago have been completed, and an application for permission to erect the line is filed with the Illinois Commerce Commission. When this 132,000-volt line is completed, generating stations of the Insull companies from Waukegan, Ill., to Michigan City, Ind., will be connected by transmission lines of this high voltage.

With the Wisconsin Power & Light Company and the Illinois Northern Utilities Company—both Middle West properties in Wisconsin—being tied together and already connected with the Milwaukee Electric Railway & Light Company on the east and the Public Service Company of Northern Illinois on the south, and with management of the Calumet Gas & Electric Company, Northern Indiana Gas & Electric Company, Indiana Service Corporation, Interstate Public Service Company, Central Indiana Power Company and Kentucky Utilities Company in the hands of Insull and associated interests, electrical interconnection already exists in the Great Lakes district from northern Wisconsin into West Virginia. It merely remains for a few more interconnections to be reinforced as indicated above to make possible the flexible interchange of energy over this entire territory.

McGraw Awards Postponed

Closing Date for Two Contests Advanced to Oct. 1 and for Contractor-Dealers to Sept. 15

THE closing dates for the filing of entries for the James H. McGraw awards for electrical men have been extended to provide a little more time for contestants to present their suggestions. There are to be four awards —a manufacturer's medal, a jobber's medal and a contractor-dealer's medal and also a medal for co-operation, open to officials or employees of any central station, manufacturing, jobbing or contractor-dealer organization or of any local electrical league or national electrical association of the United States or Canada. In each case a purse of $100 in gold will be awarded with the medal.

The manufacturer's, jobber's and contractor-dealer's awards will, as formerly announced, be presented to the man who during the year 1924 made the most constructive contributions to the commercial development of each of these three branches of the industry. The medal for co-operation will be awarded to that man who has done most to promote co-operation and harmony between any two or more branches of the electrical industry within the same period. These awards will hereafter be made annually.

September 1 had been the time set for the closing of the contests for each award. To provide more opportunity for the discussion of the awards and the presentation of entries, the closing date has been advanced to October 1 in the case of the manufacturer's and jobber's medals and the medal for co-operation. The closing date for the contractor-dealer's medal will be September 15, just in time to permit the presentation of this award to be made at the convention of the Association of Electragists International at West Baden Springs, Ind., on September 24.

Full information as to these awards may be obtained by addressing the James H. McGraw Awards, in care of the Society for Electrical Development, 522 Fifth Avenue, New York City. The committee of awards includes W. W. Freeman of Cincinnati, H. B. Crouse of Syracuse, W. E. Robertson of Buffalo, L. K. Comstock of New York, F. M. Feiker of the Society for Electrical Development and E. E. Whitehorne, commercial editor ELECTRICAL WORLD.

Defend Carillon Project

Dwellers in Ottawa Valley Demand Its Authorization and Denounce Ontario Hydro

FROM time to time opponents of the power development at Carillon, on the Ottawa River, which was the subject of considerable debate in the Canadian House of Commons during the last session of Parliament, have issued statements conveying the impression that the general public is opposed to the construction of this huge work, which it is calculated will generate 400,000 hp. In answer to these statements the Citizens' Committee of the Lower Ottawa Valley, which is supporting the proposed development, has issued a manifesto which reads in part as follows:

"It is plain to see that the present power interests do not want Carillon to generate one kilowatt of electricity, because it is certain to check the inroads of the monopoly and to give to the people of the Ottawa Valley a weapon by which they could drive the monopoly into submission. Let us repeat that in this cry of opposition to the export of power the public are not being misled, because at the present time the power interests in Quebec and Ontario are exporting possibly 250,000 hp., and with the request at Ottawa for the privilege of further exporting 45,000 hp. at peak load per annum. Therefore, it is only reasonable to set aside the loud proclaimings of those gentlemen from the Hydro Commission of Ontario who are so busy generating energy for our neighbors across the border.

"The public support the development at Carillon because it will mean the expenditure within the next few years of the enormous sum of $50,000,000 or more in construction work and thereby put into circulation much needed new capital throughout the entire district between Ottawa and Montreal, even reaching out beyond this area into other industrial centers.

"The public support the development at Carillon because it is demanding competition and fearing the growing influence of the power monopolies that is liable to retard the Ottawa Valley and compel it to continue along the line of indifference and business inactivity.

"In the face of such unanimous public feeling, surely the opponents of the Carillon development will admit that this power undertaking has found support throughout the entire Ottawa Valley, and now that it has been shown that the public are behind Carillon, the opponents will agree, if not openly, then secretly, that there is every reason for the federal government to grant the necessary legislation."

Taschereau Defends Chute à Caron Project

An official statement was recently issued by Premier Taschereau of Quebec Province in connection with criticism aimed at the Chute à Caron water-power development, together with a brief history of how the falls were originally purchased twenty-five years ago for $2,000, after an engineer had stated that there would never be any possibility of developing power from them. The present owners of Chute à Caron Falls, the Premier declared, simply ask permission to exploit something which is their own.

Mr. Taschereau expressed great optimism as to the future of the whole of the Saguenay district as a result of this development scheme, on which it is proposed to spend many millions of dollars. He stated that the promoters of the power development project intended spending over $75,000,000 in the immediate vicinity of the falls, which they were going to make the world center for aluminum production. He defended the enlistment of American capital, saying:

"I will even go as far as to say that we have not sufficient American capital invested in our enterprises. You will understand that it would be very difficult to raise $75,000,000 for a project like the Chute à Caron scheme by approaching Canadians only. We need the gold of our neighbors to help us develop. Do you believe that our paper industries would have such an easy outlet to the United States if American capital was not interested in our pulp industry?"

Finish New York-Chicago Telephone Cable

By Far the Longest Yet Installed Anywhere—Provides 250 Telephone Channels and 500 Telegraph Channels—Other Long Cables Under Construction

ON AUGUST 11 at Swanton, Ohio, 19 miles west of Toledo, the last of 9,500 splices was made in the world's longest telephone cable. The over-all length of the cable is 861 miles, 717 miles being supported overhead by 36,000 poles and 144 miles being underground. It is nearly twice as long as the next longest cable of 450 miles from Boston to Washington. The new cable will, it is expected, be open for service in about a month.

The construction of the cable has taken about seven years, without counting the time spent in preliminary engineering and research required before construction began. Telephone repeaters are to be used at seventeen points along the route, which passes through Reading, Harrisburg and Pittsburgh, Pa., Akron, Cleveland and Toledo, Ohio, and South Bend, Ind. Inductive loading coils are provided at intervals of 6,000 ft. Including the items of repeater stations and apparatus, the total cost of the cable when fully equipped will amount to $25,000,000. The cable is of quadded construction; all wires are twisted in pairs, two pairs then being twisted into quads, with the quads arranged in concentric layers. In the principal sections there are nineteen quads of 16-gage copper conductor and 120 quads of 19-gage copper conductor.

PROVIDES 750 CHANNELS

The cable will provide simultaneously more than 250 telephone channels and 500 telegraph channels. To provide the same facilities by open wire would require about ten full-sized pole lines of the usual type, each carrying about fifty wires. Open-wire construction is subject to some interference from severe storms, particularly when wires are loaded with sleet. Furthermore, the number of routes which are available is limited. Hence a single cable of large message-carrying capacity along a single route, supported by a steel strand of great tensile strength which will withstand storms, is the sound engineering solution of the problem. In extraordinarily heavy storms, although telephone poles have fallen, cables have continued to function properly.

The problem of long-distance telephony through cables is distinctly different from the problem of open-wire telephony and from the problem involved in the use of cable in local exchange plants. The technical problems involved and the research and engineering work necessary have been discussed in papers on various occasions before engineering and scientific societies.

While the New York-Chicago cable is the longest one in the world, it is only a part of a comprehensive cable system which in a few years will link many of the important centers in the more densely populated sections of the country east of the Missouri and north of the Ohio and Potomac Rivers. This cable is designed to operate as an extension of other existing long toll cables, such as the Boston-Washington cable, which ties together many of the Atlantic seaboard cities. It is also designed to operate in connection with cables which are under construction or planned, such as the cable from Chicago to St. Louis, 300 miles, to be completed in 1926, and a cable from New York via Albany and Buffalo to Cleveland, which is under construction.

Existing open-wire lines paralleling it will not be displaced as a result of the installation of this cable system, but to some extent the wire loads on such lines can be reduced. It also connects with the entire open-wire toll plant of the Bell System to handle calls from points on the cable system to other points on the open-wire plant.

Welding Society to Give Demonstrations at Convention

Plans are nearly completed to make the fall meeting of the American Welding Society the largest and most successful yet held. Three days, October 21, 22 and 23, will be devoted to the various technical sessions, demonstrations, exhibits and entertainment. The headquarters for the meeting will be at the Massachusetts Institute of Technology, Cambridge. Exhibits of welding, welded products and actual demonstrations of welding and cutting are to be featured, and leading industrial ex-

ecutives of the northeastern part of the United States are expected to be present. Demonstrations will start at 9 o'clock each morning and last until 5 p.m.

Five technical sessions are scheduled on important subjects. The papers will be printed and distributed in advance, and the greater part of the time of each session will be given over to discussion. On Wednesday, October 21, J. H. Deppeler, chief engineer Metal & Thermit Corporation, will deal with "Thermit Welding" and there will also be a paper on "Gas Welding of Power-Plant Piping." On Thursday "Industrial Applications of Arc Welding and Economies Effected Through Its Use" will be the topic of a paper by H. M. Hobart, chairman electric arc welding committee, and W. Spraragen, secretary. A series of short addresses on "Selection of Material for Weddings" will be made on Friday, and "Spot Welding of Automobile Bodies" will be described by J. W. Meadowcroft, E. J. Budd Manufacturing Company. A meeting of the research department of the society (American Bureau of Welding) will be held Thursday afternoon, when present activities will be reviewed and future investigations outlined.

I. E. S. Arranges Its Program for Detroit Meeting

Inauguration of a new Michigan Section will be one of the events of the nineteenth annual convention of the Illuminating Engineering Society, to be held at the Hotel Statler, Detroit, on September 15 to 18. On Monday, September 14, there will be special activities, including committee meetings, a round-table conference on the operation of central-station lighting bureaus and a gathering of all persons interested in the development of the society, which will be conducted by the president-elect, M. Luckiesh of Cleveland. Inspection trips and a dinner tendered by the Detroit Edison Company will also mark this day. The main events of the convention proper will be as follows:

TUESDAY, SEPTEMBER 15

Morning.—Address of welcome, Alex Dow; president's address; reports.

Afternoon.—Report of committee on motor vehicle lighting; "Improved Automobile Headlighting," A. W. Devine; "Depressible Beam Headlighting," R. N. Falge; "Late Developments in Traffic Control," C. A. B. Halvorson, Jr.

WEDNESDAY, SEPTEMBER 16

Afternoon.—Report of committee on natural lighting; "Practical Daylight Calculations for Vertical Windows," W. S. Brown; "Sawtooth Design, Its Effect on Natural Illumination," W. C. Randall; "Prediction of Daylight from Sloping Windows," H. H. Higbie and A. Levin; "Relative Value of Daylight, Tungsten-Filament and Mercury-Arc Light, and Mixtures, as Measured by Visual Acuity," Frank E. Carlson; "Effect of Mixing Artificial Light with Daylight on Important Functions of the Eye," C. E. Ferree and G. Rand.

THURSDAY, SEPTEMBER 17

(*Detroit Edison Company Assembly Room*)

Morning. — Symposium on residential street lighting; "The Fading of Colored Materials by Daylight and Artificial Light," M. Luckiesh and A. H. Taylor; "Lighting for Production," P. W. Cobb.

Afternoon.—"Lighting of Show Windows During Daylight Hours" (demonstration), E. D. Tillson, O. R. Hogue and Charles Howard; "Automobile Body Plant Lighting," J. M. Ketch, H. J. Thompson and E. F. Labadie; "Illumination of General Electric, Factories, Offices and Warehouses," works illumination advisory committee (W. D'A. Ryan chairman).

FRIDAY, SEPTEMBER 18

Morning. — "Recent Developments in Neon Lamps," D. McFarlan Moore and L. C. Porter; "A Practical Form of Photoelectric Photometer," Clayton H. Sharp and Carl Kinsley; "Isocandles," Frank Benford; "New Methods of Showing Photometric Data," Samuel G. Hibben; "Reflection Properties of Chromium," R. J. Piersol.

Entertainment is to include the president's reception and dance on Tuesday evening, a golf tournament Wednesday morning, luncheons, drives and theatergoing. An exhibition of spectacular lighting will be held on Wednesday evening and the annual banquet on Thursday evening.

Bar Association to Discuss Public Utility Law

The section of the American Bar Association devoted to public utility law will hold its eighth annual meeting on Monday and Tuesday, August 31 and September 1, at Detroit. On Monday Kenneth Burgess, general solicitor Chicago, Burlington & Quincy Railroad, will make an address on "Adequate Return." "No-Par-Value Stock" will be discussed by F. B. Odlum, New York, and by Thorne A. Browne of the Nebraska State Railway Commission, and Charles G. Blakeslee, general counsel New York Public Service Commission, will speak on "Regulation from the Commission's Viewpoint."

On Tuesday Eustace Seligman, New York, will address the convention on "The Broader Legal Aspect of Customer Stock Ownership of Public Utilities," W. D. B. Ainey, chairman of the National Association of Railroad and Utilities Commissioners, will speak, and W. W. Potter of the Public Utilities Commission of Michigan will discuss "Going Value." There will be a round-table discussion at an informal dinner on Tuesday evening.

Wisconsin Electric Men to Meet in Green Bay

Meeting on Friday, September 4, in Green Bay, Wis., the Electric Section of the Wisconsin Utilities Association will consider reports of its rural service and power-factor committees, and there will also be a discussion of overhead safety methods and devices led by E. J. Kallevang, A. G. Carson and J. E. Newton. George G. Post of the Milwaukee Electric Railway & Light Company will speak on "Effective Electric Safety Organization," A. R. Frahm of the Northern States Power Company on "Live-Line Transmission Maintenance," and Mr. Kallevang and E. H. Finkelnburg will discuss the power factor of distribution and transmission systems and power-factor correction. George H. Wilmarth of the Northern States Power Company, president of the Wisconsin Utilities Association, will respond to the address of welcome.

Charles V. Seastone is to give an illustrated lecture on water-power development with especial reference to the Peshtigo River plants of the Wisconsin Public Service Corporation, to which there will be an excursion trip on Saturday. The annual banquet will take place Friday evening.

Fifth Stave Falls Unit

British Columbia Electric System Will with This Latest Addition Be Virtually Complete

THE admission of water a week or so ago to operate the fifth unit at the Stave Falls plant of the British Columbia Electric Railway Company, which does a general light and power business in Vancouver and other cities in the Canadian province and exports power to Blaine and Sumas, Wash., marks the virtual completion of the enlargement of that plant, which has been going on for the last three years and which has cost $2,500,000. The Stave Falls plant now consists of five units of 13,125 kva. each, or a total of 65,625 kva.

As taken over from the Western Power Company of Canada at the end of 1920, the Stave Falls plant consisted of three units, rated in all at 26,475 kva. Immediately after the acquisition of this plant a fourth unit of 8,825 kva. was installed. Owing to the building of the Blind Slough dam, which enabled the level of the water of Stave Lake to be raised 22 ft., it was found possible to rewind the four generators to develop 13,125 kva. each. Further, the water storage in Stave Lake being about trebled by the new dams and being further augmented by water from Lake Alouette, where $2,300,000 is being expended, it was determined to install a fifth unit.

This unit has now been finished and is placed at the east end of the power plant, which was extended by blasting away the solid rock. This blasting itself was no mean engineering feat, being carried on within 15 ft. of generators in operation.

With the additional power from the Stave Falls plant and the 12,500 hp. which will come from the Alouette plant in the fall of 1926, an entirely new installation of transforming and switching equipment became necessary. There being insufficient room in the power house, a new outdoor switching station has been built in front of he plant over the tailrace, at a cost of $350,000. It is intended that the Alouette plant shall be of the automatic type and be operated entirely from the Stave Falls switchboard.

The new Stave Falls plant now becomes the largest unit in the British Columbia Electric system. The Lake Buntzen plant No. 1 has a capacity of 28,200 hp. and plant No. 2 of 35,800 hp. The new installation at Stave Falls brings the hydro-electric power available on the mainland up to 129,000 hp., and when the Lake Alouette plant is brought in next year there will be no less than 141,500 hp. generated on the mainland system. These figures do not take into account the steam reserve.

The demand for energy on the mainland is increasing about 10 per cent a year, according to a company publication, from which the preceding facts are gleaned.

Briefer News

One Iowa Town Refuses to Give Up Municipal Plant.—At a special election at Whiting, Iowa, to decide the question of selling the municipal light plant, citizens voted 247 to 9 against selling the plant. The nine votes were in favor of granting a twenty-five-year franchise to J. C. Roush of Sioux City. As recorded last week, more than eighty Iowa towns have decided the other way.

Drought Causes Tacoma to Seek Seattle Power.—The city of Tacoma, Wash., is drawing upon Seattle's municipally owned power plant through the Seattle-Tacoma intertie line for power, owing to the unusually low water in the Nisqually River, resulting from a combination of dry weather and low temperatures on the Nisqually Glacier. Superintendent Llewellyn Evans of the Tacoma plant expects the condition to be temporary.

Fish Cause Waterwheels to Be Shut Down.—Tons of dead and stunned fish recently lodged against the dam of the Interstate Public Service power house near Bedford, Ind., blocking the wheel pits and causing some of the wheels to be closed down. The entire countryside carried and hauled fish away. One fish weighed eighty-four pounds and a number weighed more than fifty pounds. Employees of the company in boats were kept working to prevent the trash racks from becoming clogged.

Expansion of Ottawa - Montreal Power Company.—The Ottawa-Montreal Power Company has acquired from Ayers, Ltd., of Lachute, Quebec, the distribution systems supplying light and power to a number of adjacent towns and has tied these systems in with its present system. The company has also acquired the hydro-electric plant of the Rockland Electric Company and taken over its customers. The Ottawa-Montreal Power Company is now supplying light and power to more than forty municipalities.

Excessive Prices Asked for Water Damages Cause Suspension of Work on Skunk River.—The Iowa Public Utilities company had been forced to halt operations on its hydro-electric plant on Skunk River at Oakland Mills because of the price fixed for their property by twelve farmers holding land above the dam site. A sheriff's jury awarded the farmers $70,000 damages for water damages, and the court enjoined the company from further work until the amount is paid. The company has spent $10,000 on the project.

Heavy Damage Suits Filed Against Power Company for Fire Loss.—Suits asking damages totaling $902,592 have been filed against the Great Western Power Company of California by the California Wharf & Warehouse Company and Balfour-Guthrie Company as the result of losses incurred September 13, 1924, when a fire destroyed the warehouse company's storage plant at Port Costa, Cal., and more than 9,000 tons of grain belonging to Balfour-Guthrie Company and others. It is alleged that the fire started from transformers in the transformer room of the warehouse which caught fire owing to carelessness. The power company, after investigation, denies any responsibility.

A New Unit for Dallas.—The Dallas Power & Light Company is to add a 20,000-kw. turbo-generator to its equipment, duplicating the unit placed in use about a year ago. Two years will be required to complete the installation now contemplated, which will cost about $2,750,000 and will bring the rating of the plant to 52,500 kw. The company is completing a new substation in South Dallas, erected at a cost of $250,000, and will start work this fall on a similar substation in Oak Cliff.

Illuminating the Dome of the Texas Capitol.—A long-contemplated plan has recently been carried out by the floodlighting of the dome of the State Capitol at Austin, Tex., which is now visible

from a distance of 35 miles. The equipment includes 136 floodlamps, placed around the dome, each containing a 500-watt lamp. The glass reflectors were made by the General Electric Company. The work was done under the direction of Walter Seaholm, city electrician. The cost of the equipment and installation is $9,000, and it is estimated that the lights can be operated on a five-hour basis each night in the week for $200 a month. The city of Austin, which is assuming this cost as a gift to the state, will take over the lighting plant of the Capitol, which has been run as an independent enterprise, and will hereafter supply the legislative halls with light and power.

Jamaica Public Service Doubles Plant Capacity.—The Jamaica Public Service Company, which furnishes all the light and power service and operates 26 miles of electric railway on the island of Jamaica, is doubling the present capacity of its steam plant at Kingston by the installation of a 2,400-hp. unit. The company has recently completed a transmission line to the largest sugar plantation on the island that, added to the 25 per cent increase in load obtained in the last year, will materially enlarge the company's output.

Ohio Valley Electric & Transmission Company Organized.—Announcement is made that a committee representing bondholders for coal and timber lands in Pennsylvania and West Virginia with which several small electric generating and transmission plants are affiliated is organizing their interests as the Ohio Valley Electric & Transmission Company and will proceed with a program of rehabilitation and interconnection, ultimately acquiring additional utility holdings. M. J. McCall, Kansas City, is chief engineer in charge.

Oklahoma to Have Rural Electrification Conference.—State-wide organizations interested in extension of central station facilities to the farms of Oklahoma will be represented at a farm electrification conference to be held at Oklahoma City early in September. Representatives from the Oklahoma Utilities Association, various farm organizations, agricultural newspapers, the State Department of Agriculture, the Agricultural and Mechanical College at Stillwater, manufacturers and suppliers of electrical machinery and electric utility companies will be present.

Walla Walla Rate Hearing Begun.—About thirty other municipalities have joined with Walla Walla, Wash., in the attack that city is making on the rates of the Pacific Power & Light Company of Portland, Ore. Hearings are proceeding before the Washington State Department of Public Works. The complainants contend that the company's properties are overvalued by $1,481,079, brought about by allocating a money value to water power not developed, by placing values on plants not used or useful and by inclusion of properties in Oregon in the rate base for Washington towns.

Press Commends Alabama Power Company.—The Alabama Power Company, to which was awarded the Forbes public service cup, has won also the commendation of the newspapers of the state, and W. B. Baldwin of that company claims that 92 per cent of these papers are now friendly to the company—a remarkable change of attitude on the part of some. A resolution in praise of the company's accomplishments was adopted by the Alabama Press Association at a recent convention. The company has issued a booklet containing many excerpts in its favor from local papers.

Rural Service in Ohio.—The work of constructing more than 50 miles of rural electric light and power lines has been started by the Northern Ohio Traction & Light Company in the vicinity of Akron. Approximately one thousand consumers will be added. The villages of Chittenden, Copley, Richfield and Streetsboro are included in the plans. The lines will also serve several small industrial plants with power. The company recently extended its lines to serve the towns of East

Liberty, Meyersville and Dundee. There are now approximately 125 miles of rural lines in the territory about Akron, and the extensions will bring the total mileage to nearly 200. The plans call for the construction of a new substation in the Fairlawn district within a short time.

Injunction Against Municipal Street Lighting Sought at Watertown, N. Y.—A legal fight has been precipitated at Watertown, N. Y., which has a two-million-dollar municipal power plant used as a pumping station, by the action of the City Council in authorizing the installation of street-lighting equipment at a cost of $245,000 without authorization from the taxpayers. The Northern New York Utilities holds a contract for lighting the streets, but city officials assert that the company's system is obsolete. An injunction against the city is being sought by taxpayers. If it is granted, it is thought that a referendum will be held.

Two More Paper Mills to Go on Quebec Development Company Lines.—Concurrent with an announcement that the Port Alfred Pulp & Paper Corporation has purchased 1,500 square miles of limits along the Peribonka River in the Lake St. John district of the Province of Quebec comes the announcement that the company will enter into negotiations with the Quebec Development Company, which controls the power from the Grand Discharge on the Saguenay River necessary to operate the two projected mills of the company.

Southern Power Company Makes Aërial Survey. — Airplane flights in North and South Carolina covering more than 1,800 miles and occupying eighteen days, with thirty hours' actual flying time, have just been completed in a survey made for the Southern Power Company, photographs being taken of the power plants, lines and other possessions of that company. The survey includes nearly all North Carolina west of Raleigh, and during the flight 190 photographs were made at elevations ranging from 200 ft. to 10,000 ft., the maximum being reached at Bridgewater, where pictures were taken of Lake James, owned by the Southern Power Company. Plants included were at Asheville, Hendersonville, Gastonia, Charlotte, Salisbury, Durham and Raleigh, N. C., and Spartanburg, Greenville, Anderson, Greenwood, Newberry and Union, S. C.

Engineering Teachers Attend Westinghouse Educational Conference.—The annual summer conference for engineering teachers held by the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa., elicited 150 applications for attendance last month, from which were chosen the thirty teachers who took the course. These men represented engineering and technical schools, universities and colleges in all parts of the United States. The daily schedule included lectures by the various managers of the Westinghouse departments on engineering salesmanship, industrial education, industrial problems, development in power machinery, inspection and testing of electrical equipment, electrical transportation, the personnel problem in industry, industrial research and problems of radio operation. The lectures were, as usual, supplemented with inspection trips through the Westinghouse works and to other industries and technical institutions in the Pittsburgh district. A similar conference, though on a smaller scale, was held in the South Philadelphia works of the company.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, July 4, page 50.]

Wisconsin Utilities Association, Electric Section—Green Bay, Wis., Sept. 4-5. J. N. Cadby, 445 Washington Bldg., Madison, Wis.

Camp Co-operation V (local leagues)—Association Island, Henderson Harbor, N. Y., Sept. 8-12. (Society for Electrical Development, New York, is sponsor.)

New England Division, N. E. L. A.—Hotel Griswold, New London, Conn., Sept. 8-11. Miss O. A. Bursiel, 149 Tremont St., Boston.

Pennsylvania Electric Association—Bedford Springs, Pa., Sept. 9-12. Harold A. Buch, 212 Locust St., Harrisburg, Pa.

Pennsylvania State Association of Electrical Contractors and Dealers—Hotel Jermyn, Scranton, Sept. 10. M. G. Sellers, 1202 Locust St., Philadelphia.

Rocky Mountain Division, N. E. L. A.—Hotel Colorado, Glenwood Springs, Col., Sept. 14-17. O. A. Weller, 900 15th St., Denver.

Illuminating Engineering Society—Hotel Statler, Detroit, Sept. 14-18. N. D. Macdonald, 29 West 39th St., New York.

Association of Iron and Steel Electrical Engineers—Benjamin Franklin Hotel, Philadelphia, Sept. 14-19. John F. Kelly, Empire Bldg., Pittsburgh.

American Institute of Electrical Engineers, Pacific Coast Section—Olympic Hotel, Seattle, Sept. 15-18. F. L. Hutchinson, 33 West 39th St., New York.

Great Lakes Geographic Division, N. E. L. A.—French Lick Springs, Ind., Sept. 23-26. R. V. Prather, 305 Illinois Mine Workers' Bldg., Springfield, Ill.

Association of Electragists International—West Baden, Ind., Sept. 23-25. L. W. Davis, 15 West 37th St., New York.

American Electrochemical Society—Chattanooga, Tenn., Sept. 24-26. Colin G. Fink, Columbia University, New York.

Pacific Coast Supply Jobbers—Hotel Del Monte, Del Monte, Cal., Sept. 24-26. A. H. Elliot.

Empire State Gas and Electric Association—Lake Placid Club, N. Y., Oct. 1-2. C. H. B. Chapin, Grand Central Terminal, New York.

American Electric Railway Association—Atlantic City, N. J., Oct. 5-9. J. W. Welsh, 292 Madison Ave., New York.

National Association of Railroad and Utilities Commissioners — Washington, D. C., Oct. 13-16. J. B. Walker, 270 Madison Ave., New York.

Electric Power Club—Briarcliff Manor, N. Y., Oct. 19-22. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

Association of Edison Electric Illuminating Companies — Hot Springs, Ark., Oct. 19-23. Preston S. Millar, 80th St. and East End Ave., New York.

Association of Railway Electrical Engineers—Hotel Sherman, Chicago, Oct. 20-24. J. A. Andreucetti, 413 C. & N. W. Terminal Station, Chicago.

American Welding Society—Boston, Oct. 21-23. M. M. Kelly, 29 West 39th St., New York.

Kansas Public Service Association—Topeka, Oct. 23-24. H. Lee Jones, Topeka, Kan.

Iowa State Association of Electrical Contractors and Dealers—Waterloo, Iowa, Oct. 27.

Southeastern Geographic Division, N. E. L. A.—Chattanooga, Tenn., Oct. 29-30. E. T. O'Connell, Alabama Power Co., Birmingham.

Baltimore Abolishes Its Electric Commission.—Under the provisions of an ordinance passed by the Baltimore City Council recently which creates a Department of Public Works, the Bureau of Mechanical-Electrical Service has been established. It is in charge of Charles F. Goob, formerly electrical engineer of Baltimore. The new bureau, as well as several others that were created by passage of the ordinance, is under the supervision of Bernard L. Crozier, chief engineer of the city. Under the provisions of the ordinance the Electrical Commission of the city has been abolished and the work performed by that body turned over to the bureau. The same also is true of the office of Superintendent of Lamps and Lighting.

Shenandoah Valley Consolidation Carried Through.—As foreshadowed in these columns on August 1, four independent companies in the southern Appalachians have been merged to form the Shenandoah River Power Company, Inc., the majority of the stockholders of the four old companies having transferred their holdings to the new corporation. The merger is said to involve more than a million dollars. The properties will be operated by Ives & Davidson of New York. The companies entering the merger are the Weyers Cave Light & Power Company, the Valley Light & Power Company of Woodstock, the F. A. Shank Company of Timberville and the T. A. Andrick Company of New Market. These plants supply virtually all the light and power to small communities in Augusta, Rockingham and Shenandoah Counties, Va. It is expected that the new corporation will greatly expand the plants.

Coal Miners and "Giant Power" Propaganda.—Announcement is made by Frank Farrington, president of the United Mine Workers of Illinois, that Otto M. Rau, who is consulting engineer for Governor Pinchot's "giant power" survey and who was retained by the union to investigate the feasibility of erecting plants at the mouths of coal mines for the conversion of Illinois coal into electric power, has recommended that the plan be "pushed with energy and enthusiasm." Mr. Farrington's proposal is that a semi-public corporation be organized, in which the miners, operators, consumers and the state would be interested, to establish one or more power plants on the Ohio and Mississippi Rivers for the manufacture of electricity through burning Illinois coal; to form an integrated system of major and minor power lines to serve every hamlet and farmhouse in the state, and to treat coal at the power plants so that valuable by-products could be saved.

Men of the Industry

D. E. Harris Heads Pacific States Electric Company

D. E. Harris was named president of the Pacific States Electric Company, San Francisco, at a meeting of the board of directors on August 18, to fill the position left vacant by Tracy E. Bibbins, who died last month. Mr. Harris started his electrical career twenty-seven years ago as office boy for the company of which he is now the head. He is one of the outstanding figures of the electrical industry in California and has been connected intimately with the development and expansion of the use of electrical appliances. Mr. Harris was one of the organizers of the California Electrical Bureau and aided in sponsoring the first electrical homes displayed in California. He also has been active in the work of the Pacific Coast Electrical Supply Jobbers' Association.

At the same time the company announced the election of **H. R. Noack**, vice-president of the company, to the board of directors. Mr. Noack entered the electrical industry in 1898 with John Martin, who represented the Stanley Electric Manufacturing Company and the Locke Insulator Company. Mr. Noack was active with Mr. Martin in effecting the consolidation of a number of early power companies which later became the basis of the Pacific Gas & Electric Company system. John Martin & Company later became Pierson, Roeding & Company. Mr. Noack retained his interest in that company until 1917, when he joined the force of the Pacific States Electric Company. He is head of the high-tension transmission department of the Pacific States company and has been a vice-president since 1921.

Thomas Ahearn, president of the Ottawa Light, Heat & Power Company, Ottawa, Canada, has been made a director of the Bank of Montreal.

Edwin J. Bean has resigned as a member of the Missouri Public Service Commission after serving two years as general counsel and ten years as a member. Mr. Bean will resume the practice of law with offices in St. Louis.

John H. Porter, a consulting engineer of St. Louis, has been appointed a member of the Missouri Public Service Commission by Governor Baker to succeed E. J. Bean of De Soto, who resigned.

W. N. Hernion has been appointed assistant general manager of the Southern New England Electric Company, with headquarters in Hartford, Conn.

Raymond Wilcox, formerly with Dwight P. Robinson & Company, Inc., has become treasurer and general manager of the Engineering Corporation, recently incorporated to conduct a manufacturing business at Long Beach, Cal.

H. Edmund Machold, formerly Speaker of the New York State Assembly, has resigned as president of the Northern New York Trust Company of Watertown to affiliate himself with the Carlisle interests. On September 1 he will assume the duties of vice-president of the F. L. Carlisle Company, Inc., New York City. F. L. Carlisle is at the present time chairman of the board of directors of the Northern New York Utilities, Inc. It was under the leadership of Speaker Machold in the Assembly that the water-power and traction program of former Governor Miller was put through the State Legislature.

W. D. Johnston Receives Promotion

W. D. Johnston has been appointed general manager of the Mountain States Power Company, the organization formed by the Byllesby interests to take over the Natrona Power Company at Casper, Wyo., and its smaller subsidiaries. His electrical experience dates back to 1909, when he became associated with the Nunn interests in

W. D. JOHNSTON

the operation of the Telluride Power Company of Utah. He was awarded a scholarship in 1912 by the Telluride association, the educational foundation established by L. L. Nunn in connection with Cornell University, and in 1917 was graduated with the degrees of A.B. and M.E. For three years following his graduation he was designing and power engineer for the Bell Telephone Company of Pennsylvania and since 1920 has been general superintendent of the Natrona Power Company at Casper, Wyo., a Nunn subsidiary, under the direction of E. P. Bacon, whom he succeeded when the company was sold to the Byllesby interests and Mr. Bacon formed another company. Mr. Johnston is one of the youngest utility executives in the Rocky Mountain region.

Malcolm J. McCall, formerly connected as general engineer and accountant with the vice-president's office of the Kansas City (Mo.) Power & Light Company, has been appointed chief engineer and chief accountant of the bondholders' reorganization committee of the Ohio Valley Electric & Transmission Utilities, formed to direct the rehabilitation of certain properties, as mentioned in the "Briefer News" of this issue. As chief engineer and accountant of this committee Mr. McCall is in charge of the reorganization, including all valuations, audits, reports issued and the engineering activities in connection with the plans for rehabilitation, interconnection and new developments, with offices in Kansas City.

William Henry Patchell, British consulting engineer, arrived in New York last week from England for an extended visit to the United States in connection with his consulting activities.

Arthur Williams, vice-president of the New York Edison Company, has been appointed chairman of the anniversary committee of 170 bankers, property owners and others, including many prominent citizens, organized to celebrate the "hundredth birthday" of Forty-second Street, New York, on September 30.

E. J. Kingsbury and **E. E. King**, formerly with Dwight P. Robinson & Company, Inc., have opened an office in the Grant Building in Los Angeles as consulting engineers under the name of Kingsbury & King. Mr. Kingsbury is also president of the Engineering Corporation of Long Beach, Cal., and is the inventor of several patented devices which bear his name and will be manufactured by this corporation.

Charles L. Hutchinson, president of the McGraw-Hill Company of California and editor of the *Journal of Electricity*, has been elected chairman of the California Electrical Bureau, an organization which is the outgrowth of the California Co-operative Campaign.

Lamar Lyndon, consulting engineer, has just returned to his offices in New York after an absence of more than two years in France, Mexico and California. During a varied career in the engineering field Mr. Lyndon has served as manager of foundry and machine works, engineer with a gas and electric company and assistant to a firm of consulting engineers in New York. From 1896 to 1898 he engaged in engineering work in Japan, China, Burmah, India and England. Since 1900 he has practiced as a consulting engineer. Mr. Lyndon is a fellow of the American Institute of Electrical Engineers.

R. I. Thompson, who for the past four and one-half years has served as manager of the Durham branch of the Carolina Power & Light Company, has been transferred to the company's Raleigh office, and **J. S. Knowlen**, formerly manager of the Hamlet branch, has been transferred to Durham to succeed Mr. Thompson.

R. J. Everest has been appointed assistant manager of the Salisbury (N. C.) branch of the Southern Power Company. Mr. Everest is a native of Canada and for twelve years was connected with the Shawinigan Water & Power Company of Montreal. He will be acting manager in the absence of John M. Wolfe, manager, who is recuperating from an illness that has incapacitated him for several months.

Samuel B. Flagg, who has been associated with the Riley Stoker Corporation of Worcester, Mass., as special representative at New York City for the past two years, has resigned and is again associated with the Electric Bond & Share Company as fuel expert. Mr.

Flagg was connected with the Electric Bond & Share Company for six years previous to entering the employ of the Worcester organization.

R. P. Waite, formerly connected with the Southern California Edison Company, Los Angeles, is now electrical engineer in charge of design for the Texas Power & Light Company, with headquarters at Dallas.

H. L. Mann, formerly manager of the People's Gas & Electric Company at Sigourney, Iowa, has resigned to become manager of the Iowa Southern Utilities Company at Chariton, in the same state.

H. Blake Fuessenich has been elected secretary of the Torrington (Conn.) Electric Light Company, succeeding his father, Frederick F. Fuessenich, who recently died. Other officers were reelected.

Eugene M. Dole was elected treasurer of the Bangor (Me.) Hydro-Electric Company, at a meeting of the board of directors, to succeed Howard M. Corning, resigned. Mr. Dole was formerly assistant treasurer of the company.

Rufus Moses, Youngstown, Ohio, manager of the local Electrical League, has been appointed superintendent of the Shenango Valley Electric Light Company, Sharon, Pa., succeeding Mark Pendleton, recently resigned.

Mark Pendleton, for the past five years general superintendent of the Shenango Valley Electric Company, Sharon, Pa., has resigned, to become general manager of the Pennsylvania Gas & Electric Company, York, Pa., effective September 1.

R. F. Gooding, for the past three years associated with Charles B. Hawley & Company, Inc., consulting engineers of Washington, D. C., will sever his connection with that firm September 1 to take over the agency in the Pittsburgh district for Condit switchboards, circuit breakers, etc.

Obituary

Frank L. Smith, engineering accountant in charge of the construction cost work of Stone & Webster, Inc., at the Weymouth station of the Edison Electric Illuminating Company of Boston, was killed August 23 in an automobile accident at North Wakefield, N. H.

Don Juan Urrutia y Zuluetia, president of the Associacion de Productores y Distribuidores de Electricidad, died recently at Neguri, Bilbao, Spain. He had played an important part in hydroelectric development work in Spain and was a director of both the Sociedad Hidro-Electrica Española and the Sociedad Hidro-Electrica Iberica.

Stedman Buttrick, a partner in the Boston banking house of Estabrook & Company and prominent in the directorates of the Blackstone Valley Gas & Electric Company, Lowell (Mass.) Electric Light Corporation, Puget Sound Power & Light Company and other utilities and industrial companies, died at Concord, Mass., August 22 at the age of sixty-one.

Commission Rulings

Ten per Cent of Construction Costs for Engineering and General Supervision Too High.—Criticising an item for "construction overheads" included in the valuation made by the Rockford Electric Company's engineers of the company's property and equaling 26.7 per cent of the actual construction costs, the Illinois Commerce Commission pointed out that the firm of Hagenah & Erickson, engineers employed by the company, added to cover the same item only 15 per cent of the construction costs. "It appears," said the commission, "that the Rockport Electric Company pays to the parent company, the American Gas & Electric Company, 10 per cent on all construction expenditures to cover engineering and general supervision. The record indicates that this percentage is greater than that which would be charged by an outside engineering firm for performing the same service. The commission can find no good reasons for an allowance of an overhead percentage as high as that claimed in the appraisal of the company's engineers and believes that the amount set forth in the report of Hagenah & Erickson is a reasonable allowance."

Commission Has Power to Change Private Contracts.—"A public utility cannot avoid or escape the jurisdiction or control of the Corporation Commission by entering into a contract with a private manufacturing enterprise concerning the price of gas consumed by such enterprise upon the theory that the gas so provided is surplus in excess of the amount necessary to supply the demands of the domestic customers." This was the holding of the Oklahoma Supreme Court in an opinion sustaining an order of the Corporation Commission of the state in the case of the Eagle Picher Lead Company vs. Henryetta Gas Company. The appeal was taken by the Eagle Picher Lead Company from an order of the commission increasing rates charged it by the Henryetta Gas Company from 4 cents per 1,000 cu.ft. to approximately 7 cents. The contention was made that the commission abrogated certain contracts existing between the two companies. The opinion holds that the Corporation Commission has jurisdiction to change such contracts in the interest of the public.

How Far Are Promises and Agreements Made by Construction Company Binding on Utility Buying Distribution Line?—Dispute having arisen about the connection fees to be paid by certain customers desiring service over a distribution line built for the village of Potosi, Wis., and subsequently sold to the Interstate Power Company, with whose system it was connected, the Wisconsin Railroad Commission made the following rulings: (1) Neither a municipal electric plant nor a power company which has purchased a transmission line from the plant is bound by oral promises made by a construction company to subscribers along the transmission line, nor by any agreements which may have been entered into between these parties, as to what service might be had on payment of one connection fee. (2) A village which has constructed a transmission line and a power company which has acquired the line, by the acceptance of the benefits of a written agreement between the construction company and consumers along the line, assume the legal duty to carry out the reciprocal obligations imposed by the contract as a consideration for such benefits. (3) The commission and the courts are bound to enforce a written contract between a utility and prospective consumers along a transmission line if the contract is complete and unambiguous and not in violation of law nor inconsistent with the utilities act, and the commission may not concern itself with the plight of the utility in having obtained fewer connection fees than it had expected, nor with the reasonableness or otherwise of permitting certain consumers to connect with various buildings by paying one connection fee.

Recent Court Decisions

Company's Liability for Damages Caused by Outsider's Tampering with Its Wires.—Bobbitt vs. Pine Bluff Company was a suit in which a jury awarded damages for the injury of a child who came into contact with a guy wire belonging to the company around which another wire had been wrapped of which the other end had been thrown across an uninsulated 2,300-volt conductor belonging to the company. The wire through which the injury was received was no part of the company's system, and it was not charged that the company was originally responsible for its presence, but that it was negligent in not removing it. Reversing the finding of the lower court on errors, the Supreme Court of Arkansas held that a requested instruction that if the wire causing injury was placed over defendant's electric wire and connected with guy wire by some unknown third party, and if company did not known of such connection and could not have known of it by exercise of ordinary care, it would not be liable, was correct and improperly refused by the trial court. The Supreme Court held further that the rule that an electric company need use merely ordinary care to discover condition of wires applies not only to its own wires but to wires brought in contact with its own. The company, however, could not excuse itself by showing merely that the foreign wire was attached to the guy wire by some third party. The issues for the jury were how long the condition existed and whether the company was negligent in not discovering and removing the foreign wire. (273 S.W.1.)*

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

Better Co-operation Still Needed

Central-Station Companies and Electrical Supply Jobbers Are Urged to Work Together—Help in Warehousing and Through Technically Trained Salesmen

BY A CENTRAL STATION PURCHASING EXECUTIVE

IN AN industry growing as fast as is applied electricity it is to be expected that there will always be problems of interbranch relationship to consider among those responsible for progress, whether along technical or commercial lines. We have heard a great deal of late about the relation of the jobber to the manufacturer and to the contractor-dealer, and much good has come about from these discussions. I should like to say a few words, if I may, about the opportunities for closer co-operation between the jobber and the central-station company, for in some cases, certainly, the conditions are susceptible of improvement.

My company is under the single management of its stockholders' board of directors and their elected executives, and the problems of syndicate-operated utilities do not concern us at present as regards relations with other branches of the industry. Like many other central stations, we are subjected to more or less criticism because we purchase much of our material and equipment direct from the manufacturers. There are reasons for this which throw considerable light upon the functions of the jobber, and our relations with him.

WANT HELP IN WAREHOUSING

We do buy fair amounts of wiring supplies from jobbers in our general territory, although we do no house wiring ourselves. On a system of even moderate size there is constantly under way a considerable amount of reconstruction work of an electrical character, and in the course of a year I believe we do enough business with our local jobbing interests to make it desirable for them to retain it. Our departments value service very highly, and where the jobber actually does serve us promptly and intelligently, we are glad to deal with him on a reasonable price basis and appreciate his interest and facilities. I need not emphasize the value of central-station credit risks in this connection.

Our company sells at retail a vast assortment of electrical appliances. The quantities of these which we dispose of in the course of a year require considerable storage space, and we feel if we purchase such equipment through the jobbers, we should be relieved of maintaining stocks of more or less bulky material. It has happened in some cases where we have bought carload lots of equipment of the washer, cleaner and ironer type from the jobbers that we have had to store this material far from our salesrooms at our own expense and have been obliged to truck it around from depots to stock houses and back to the electric shop "on our own."

We received very little more than clerical service from the jobbers involved, and I think it is a fair statement that the jobber should do more than write one or two letters in passing along orders if he is to figure in real service to the central-station company. In a typical case the price we paid the jobbers for some carload shipments of appliances was no more than it would have been had we gone directly to the factories, but the jobbing interests received a substantial commission for handling these orders. It seems to me that in return for this commission the jobbers should save us the cost of maintaining these large local stocks to serve our various districts, and if they would do this, we would gladly co-operate in purchasing.

TECHNICALLY TRAINED SALESMEN

Just as mass production is the foundation of modern manufacturing success, so mass sales lie at the bottom of the jobber's profits. The central station cannot expect to match up with the local wiring trade in volume of purchases of this class of material; but I believe it is possible for the jobber to develop a better contact in the future with the utilities through the medium of more technically qualified salesmen.

We do not go to the jobber's store and buy small transformers, meters, oil circuit breakers, regulators, etc., like so many pounds of flour or sugar. Highly standardized as such devices are, there are still many technical problems coming up in their application. Nothing stands still in the electrical world. We are constantly putting more pressure upon equipment to serve us under more severe operating conditions, and while the meeting of such problems is primarily a task for the designing engineers of the manufacturing companies, it is very important for the jobber to develop more and better qualified specialist salesmen competent to discuss with our engineers the performance of apparatus in service and to contribute constructive thinking in the negotiations for purchase. I am certain that central stations generally stand ready to co-operate to the utmost with the jobber in thus building up a sort of technico-commercial alliance. We do not expect this improvement in sales force training to be brought about in a few months, but here is an opportunity for co-operation along lines which in the past have with a few shining exceptions been somewhat overlooked.

Like all good business men, we seek to obtain a fair return for the money we spend on material and equipment, and I believe that if the jobber will give more thought to how his organization can increase the value of its services in the central-station contact, much good will result. It cannot be expected that the jobber will function in the marketing of heavy and specialized equipment, but down in the list of smaller-capacity and standard products I believe that there is a real field in which we can co-operate.

To the manufacturer the jobber stands today as a most valuable credit agent in relation to the retailers of the former's territory. There is little or no need for the jobber to perform credit functions between the central station and the manufacturer, but I am sure I am not alone in the view that the jobber can be of great service to both the manufacturer and the central station if he will combine his stockroom facilities with superior sales technique and build up closer relations along the lines intimated above.

No Thought of "Policing" Simplified Practice

A report to the effect that the Commerce Department is working out a plan to "police" simplified practice and standardization agreements is denied vigorously by Secretary Hoover. There never has been a thought of anything other than to prompt industry to do these things for itself. Usually adherence to the simplified program is its own reward, but in the exceptional cases where producers have not lived up to the agreement the industry itself, Mr. Hoover states, has found little difficulty in securing compliance when the matter is taken up formally with the offending member.

Foreign Monopolies—Trade with Germany

With the approach of another session of Congress, Secretary Hoover has renewed his plea for some form of counteraction against foreign monopolies which exact unreasonable profits from American consumers. Extension of the Webb-Pomerene laws to imports so as to allow American buyers to present a solid front to a foreign combination he regards as the most practicable step that could be taken, but he makes it clear that he will go along with any other proposition calculated to get results. He feels, however, that when because of manipulation Americans are forced to pay an additional $82,000,000 in a single year for coffee alone self-defense in some form should be forthcoming.

Approval by the Reichstag of the commercial treaty which was ratified by the United States Senate in January has an important bearing on our foreign trade with Germany, Secretary

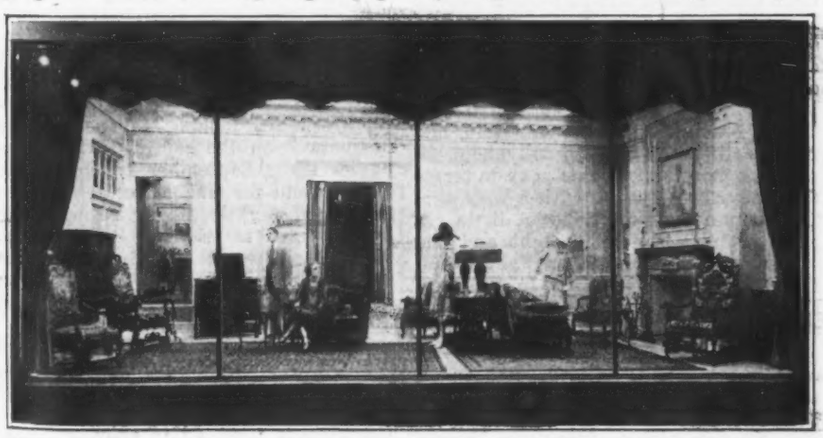
Hoover points out. While the United States has been accorded most-favored-nation treatment by Germany, it has been by courtesy only. We now are in a position to demand that treatment as a matter of right. The fact that we are assured against any sudden withdrawal of that privilege means much to those who ship goods to Germany.

Secretary Hoover thinks the new German tariff is not so formidable as it looks. Some of these schedules are due for material reductions at an early date under the flexible provisions of the law.

A Model Shop and Show Window

Made a Permanent Exhibit of the National Art and Industry Exposition at Atlantic City, N. J.—N.E.L.A. and Electrical Manufacturers Co-operate in Its Production

A MODEL store and showroom, called "America's Model Shop," has been made a permanent exhibit of the National Art and Industry Exposition at Atlantic City, N. J. This store and showroom faces the Boardwalk at the southern end of the entrance to the Million Dollar Pier. The opening of this model shop was previously announced in the ELECTRICAL WORLD. The store and showroom is being used to display the products of national advertisers. Before proceeding with the construction of the model store and show windows, A Conrad Ekholm, managing director of the exposition, obtained the co-operation of the National Electric Light Association to the extent of having Charles Munroe, chairman of the lighting committee, appoint a special lighting committee to lay out and design the electrical lighting equipment which was to be used in lighting the windows and the store.



NIGHT VIEW OF MAIN SHOW WINDOW TERMED THE "WORLD'S FINEST SHOW WINDOW"

The committee appointed consisted of Ward Harrison, chairman, National Lamp Works, Nela Park, Cleveland; George H. Stickney, Edison Lamp Works, Harrison, N. J., and Samuel Hibbens, Westinghouse Lamp Company, New York. The lighting committee, in making the recommendation for the exhibit, said: "In making this recommendation, it has been borne in mind that the exhibition hall is to be used not only for the display of merchandise but is also to serve as an example of the latest thought in ways and means of merchandising. It has been acknowledged for some time that lighting plays no small part from the viewpoint of retail merchandising. Effective lighting in the show window and within the store are assets which mean much in the way of compelling attention and presenting merchandise to the best advantage. The atmosphere of progressiveness found in a well-lighted store is something which should be capitalized by the wide-awake merchant."

This model store has one large show window, shown in the illustration, facing on the Boardwalk, two smaller show windows facing on the ramp leading up to what formerly was the machinery space on the pier, and several smaller windows facing toward the interior of the pier. The large window, 30 ft. long by 17 ft. deep, is provided with twenty-two 500-watt lamps in mirrored glass reflectors and twenty 150-watt "Mazda C" lamps in mirrored glass reflectors. The setting and background of this window is of the very best grade of workmanship, and was laid out to represent a Georgian living room setting.

One of the side windows is equipped with three banks of reflectors for color lighting, and various changes in cycles of colors may be obtained through a motor-operated dimmer set. The remainder of the windows are equipped with various types of reflectors which are suitable for the size and proportions of the windows.

The interior of the store is lighted by means of an indirect lighting system, and a small stage is provided for use in giving lectures, talks and demonstrations on various items of interest. The stage is equipped with border and disappearing footlights, together with a stereopticon, spotlights, etc. It is a demonstration of typical stage lighting.

In addition to the work of the National Electric Light Association in making the lighting recommendations the following manufacturers extended their co-operation: Curtis Lighting, Inc., Chicago; I. P. Frink, Inc., New York; the Miller Company, Ivanhoe Division, Meriden, Conn.; the Holophane Glass Company, New York; the Ward Leonard Electric Company, Mount Vernon, N. Y.; the General Electric Company, and Lenox, Inc., Trenton, N. J.

The exhibition of store and window lighting is in a very elaborate setting. A number of men in the electrical industry have already personally inspected "America's Model Shop" and have expressed their opinion that it presents a wonderful opportunity of selling the idea of proper lighting in all its phases to those who visit it.

Patents and Trademarks

Improvement of International Agreements to Be Sought at Hague Conference in October

IMPROVEMENT of the international patent and trademark situation will be discussed next October among the official representatives of forty nations who will meet in a treaty-making conference at The Hague to submit proposals for altering the existing international agreement for the protection of industrial property. The amendment to the patent situation which will be offered by the American representatives is as follows:

No requirements as to working or granting of compulsory licenses shall be imposed upon patents taken out in any of the countries of the union other than those required by the laws of the country of origin.

No greater tax or annuity shall be imposed upon patents taken out in any of the countries of the union other than those required by the laws of the country of origin.

Where the patent has lapsed in any of the countries owing to the failure by accident or inadvertence to pay any prescribed fee within the prescribed time, then the patent shall be restored upon payment of said prescribed fee, provided that no undue delay arises in applying for the restoration of the patent after the lapsing is discovered, and in no event later than one year from the date when the prescribed fee was due, and subject to such penalties and restrictions of rights as the domestic laws may prescribe for the protection of persons who have availed themselves of the patent after it has lapsed.

For the protection of the trademark of the American manufacturer, who under existing agreements is frequently prevented from capitalizing on his trademark in a foreign country owing to its appropriation by a citizen of that country, the following amendment is suggested by the United States:

Any registration effected in one of the contracting countries by an agent, representative or customer of the owner of a trademark previously used in one of the other countries shall be regarded as belonging to the said prior user of the trademark and inure to his benefit, and each of the contracting countries agrees to afford adequate proceedings for securing this right.

Where a trademark owned and in use by a party in one of the contracting countries is subsequently registered in another country by one not the prior user, and it appears that said registration is for the purpose or has the effect of preventing the registration or use of the mark in commerce in the other country by the owner and original user of the mark, such owner and original user shall be regarded as the rightful owner and shall be entitled either to have such registration canceled or to recover the mark in accordance with procedure for recovering property under the laws of the country where thus registered.

The International Bureau at Berne and Holland proposes a new article in the present agreement, as follows:

The contracting countries undertake to refuse or invalidate any trademark well known as being already the mark of a citizen of another country. A minimum period of three years must be allowed to interested parties to demand invalidation of marks thus registered.

France, Great Britain and Italy have suggested that the minimum period

should be five years. The bureau at Berne and Holland also suggests as a further addition that:

> The contracting countries agree to assure in their national legislation to the citizens of the other contracting countries a legal remedy embracing, besides civil penalties, also criminal penalties against fraudulent use of their marks.

The subject of "unfair competition" is also expected to receive much attention at the conference, and an endeavor will be made to clear up the confusion that now exists and to come to a better understanding of just what is meant by "unfair competition."

Business Conditions

THE electrical business continues on the upward trend, with the most notable activity in New England and on the Pacific Coast, although the demand for electrical equipment in the coal regions, usually good at this time of the year, is now inactive, the tendency in that section being to hold off expenditures awaiting the outcome of the strike negotiations. Conditions throughout the country are most encouraging however. Car loadings continue to break records. The steel mills are increasing their operations, and the United States Steel Corporation is now at 73 per cent capacity as against 61 per cent in July. Both retail and wholesale trade are considerably better than a year ago. The electrical market is clearly tuning up to receive the large demand expected next month. Central-station buying continues the strongest factor. Jobbers report larger sales and inquiries. Wiring devices and motors are moving well and industrials are buying more actively. Domestic appliances are still rather quiet.

In New England building continues unprecedented. Power equipment is active, also central-station supplies. Good sales were made to the paper and textile industries. Industrial buying is better in the New York district. Central stations are ordering transformers and switching equipment. There are increased sales of motors in the Southeast. Line material is stronger, also oil switches, both high and low voltage. Moderate improvement continues in the Middle West. Jobbers' sales are better and appliances more active. Power companies are buying in quantity on the Pacific Coast. Appliance sales are larger, particularly radio.

Better Outlook for Textile Motor Sales

MOTOR sales for driving textile machinery are showing considerable improvement of late, taking the country as a whole. One manufacturer reports that this year's sales have already exceeded the total bookings of 1924 in this line, and although some motor builders are dissatisfied with the general quiet in the textile machinery situation, the outlook is fairly good for the fall trade. There are virtually no new mills erected today without electric driving, and the trend toward the individual motor drive is a dominant feature of the market. One manufacturer states that the synchronous motor is not making much headway in the textile field notwithstanding its power-factor-corrective properties when properly excited for the local conditions, and that the use of synchronous and static condensers is meeting power-factor requirements more satisfactorily in plants where the number of induction motors is large enough to warrant their installation. Business is showing some life here and there in the modernization of old mills. Prices are steady after a recent reduction of the order of 10 per cent, and deliveries are thoroughly satisfactory. Sales are well distributed North and South with some shipments recently to South Africa and Europe. About two-thirds of the textile mills in the country are now motor-driven.

Magnetic Chucks Moving Better as Machine Tool Market Stirs

AFTER many months of rather dull business, manufacturers of magnetic chucks report an improved outlook for fall business corresponding to a stirring of the machine-tool markets recently noted. Plants are still being operated far below capacity, but two leading houses report that a distinctly better feeling is in the air and one manufacturer expects to sell about 25 per cent more chucks this year in terms of money as compared with a year ago. The demand is spotty, but a little export business is now in sight and one or two recent orders from France and England are encouraging. In Germany local manufacturing competition is acute and few sales from this country are being made in this line. Large chucks for planer service are being purchased here and there in this country, with maximum holding power up to 220 lb. per square inch and energy consumptions up to about 8 kw. Equipment lately sold to a large roller-bearing house is giving a good account of itself in piston-ring machining. In some quarters it is believed that the sale of magnetic chucks would be in greater volume if more exact data on their time-saving features in setting up work were available, and it is expected that fall inquiries will stress this aspect of their service in view of the pressure upon manufacturers to reduce costs.

Non-Ferrous Metals Prices Steady with Slack Sales

IN SPITE of slack sales this week in the non-ferrous metals market, prices have held up well. Domestic sales were small, with practically no orders from foreign markets. Copper did not quite reach 15 cents and has now eased to 14.75. Lead is weaker but with ample inquiries for September.

On Thursday, August 20, producers sold some copper at 14.95 cents in the East and 15 cents in the West on Friday. Then the London market weakened, and the total sales for the week were only about one-half of the recent high week ended August 5.

Lead still leads the market. The American Smelting & Refining Company advanced its official contract price from 9.40 cents to 9.50 cents on Wednesday, August 26. The demand is good. The metal is still scarce, and the taking of foreign ore lead for European markets is a possibility.

NEW YORK METAL MARKET PRICES

	Aug. 19, 1925 Cents per Pound	Aug. 25, 1925 Cents per Pound
Copper, electrolytic	14⅞	14.75
Lead, Am. S. & R. price	9.40	9.50
Antimony	184	17–17¼
Nickel, ingot	33–34	33–34
Zinc, spot	7¼	8.075
Tin, Straits	57.50	57.50
Aluminum, 99 per cent	28	27

Base copper price Aug. 25, 1925, 16½ cents.

Many Small Diversified Orders Continue in New York District

CENTRAL-STATION companies in the New York district are placing orders steadily for small power transformers and distribution transformers, and purchases of switching equipment are holding up well. There have been no spectacular sales during the week, but manufacturers say that the many small orders placed are in the aggregate large. A steady volume of inquiries is being received and this activity is expected to continue. Manufacturers are looking for some large business from the central-station companies after September 1. Meanwhile the demand for line material has been falling off slightly after a rather active July, except in western Pennsylvania, where much work is under way. One manufacturer reports the receipt of an order from that section covering about $60,000 worth of material.

A number of inquiries and small orders are coming from industrial firms. One manufacturer reports a good demand for industrial heating appliances. Contractors engaged in subway operation have been active in the market and have placed several orders with jobbers for conduit, wire, switches, etc. One purchase from that source is also reported as covering 3,450 kva. of transformers for air-compression operation.

Jobbing Better in Middle West—Power Company Buying Active

CONTINUATION of the moderate business improvement in the Middle West territory is recorded this week, and a better demand for most commodities is noted, although still on a conservative scale. The various utility companies still play an important part in the general betterment of business conditions by continued construction work and also by maintenance purchases.

Among the interesting orders placed this week were one for "Mazda" lamps to the value of over $500,000 for delivery the last quarter of the year and

another for spare blading for turbine elements in excess of $40,000. There has been a steady demand for transformers, pole-line hardware and meters.

Jobbers' sales have accelerated somewhat. A greater number of inquiries have been received this week than previously, particularly for fractional-horsepower motors. Appliances have moved well, particularly washing machines, one jobber placing an order recently for 500 machines. Hotel and restaurant equipment sales have been quite brisk, with radio sales increasing.

Prices remain firm, generally. Lead sleeving prices advanced 25 cents per 100 lb. this week and solder prices stiffened somewhat. Wires and cable prices remain firm, although higher prices are anticipated.

New England Buys Power and Line Equipment

GOOD-SIZED orders and a noticeable increase in electrical sales were the feature of the electrical market throughout New England during the past week. Power equipment is in good demand. One manufacturer reports the sale to a paper company of the first sectional-drive motor and control equipment in New England costing about $100,000, and in addition a dual-frequency calender drive to the same company costing about $20,000. The demand for textile motors is also improving and many appropriations are being made for modernizing old mills. Jobbers also report a good volume of sales of small power units and a steady flow of inquiries for this kind of apparatus.

Central-station supplies and line material are quite active and during the past week heavy movements in pipe, wire and line hardware were reported, with a brisk business in sockets, conduit, and control appliances. Scheduled supplies in general at the present time are showing noticeable activity.

There is much development work under way in industrial heating, and the machine-tool industry is showing more activity. Interest in magnetic chucks is reported to be quite strong. Industrial lighting and house wiring show good volume, with a resultant demand for fixtures and interior wiring equipment. A strong trend for frosted and tinted lamps is apparent. Household domestic appliance sales are spotty. An unprecedent volume of building continues throughout this district.

Business Continues Strong in Pacific Coast Markets

POWER-COMPANY purchasing has been spectacular during the past week, pole-line hardware predominating to the extent of two carloads from San Francisco and one carload from the San Joaquin district. Contractors' orders are limited apparently to mid-month shorts. The record-breaking value of building permits all over the state, however, assures an excellent year from this class of customer. Store business is improving, and dealers report good sales of larger appliances, and especially of the console type of radio sets. The present radio exposition in San Francisco is accomplishing much needed education work. Neighborhood dealers report a tendency to slower pay in appliance installment sales, due no doubt to vacation season laxity. Country business is very good and reflects confidence in the season's crops.

Export sales include cable for the Philippines, but also good staple wiring lines in packages. Industrial purchasing includes stock orders for reflectors and globes and material for three new service stations from oil companies and some good standard material from irrigation companies. Three mammoth hotels are projected, for Oakland, San Francisco Beach and the Hawaiian Islands respectively. Construction costs for the one at Oakland are now being figured by contractors. Prices are quite steady, such minor changes as have occurred having been advances. The total volume of general sales has dropped off somewhat in the Northwest. Domestic appliances are moving better.

Industrial Sales Moving in Southeast—General Volume Up

REPORTS from jobbers indicate an improvement in the volume of electrical business done last week in the Southeastern States, not only in the volume of sales but in the number of inquiries in hand and the prospects for fall trade. The recent spell of very hot weather caused a final spurt in the movement of fans, making this the best season on record, and there will be practically no carry-overs of this item. Central stations in south and middle Georgia are ordering poles, line materials and wire in good volume. An Atlanta jobber reports the receipt of one "White-way" installation order from a middle Georgia town totaling $15,000.

Socket appliances and hollow ware have not yet begun to show signs of fall activity with the exception of flat-irons. Electric ranges have been in good demand and electric refrigerating equipment, in both domestic and soda-fountain types, continues to gain steadily.

The past week has brought in a very satisfactory volume of orders for industrial materials, with many jobs scheduled to be launched in the early fall. Industrial motors in 5-hp. to 100-hp. sizes in the aggregate show considerable increase in sales, with prospects for even greater improvement within the next sixty days. Manufacturers are reporting a fair movement of low-voltage oil switches with a few purchases of the high-tension oil switches, inquiries concerning the latter type being satisfactory.

General conditions of crops throughout the Southeast as a whole foreshadow an excellent volume of business from the rural sections. In the north no rains to speak of have fallen and the power shortage is proportionately more severe.

Activities of the Trade

Springfield Engineering Firms Move Offices

McClintock & Craig, Springfield, Mass., have moved their offices to the Harris Building, Bridge and Chestnut Streets, and the Samuel M. Green Company of the same city has relocated at 496 Bridge Street, Springfield.

Superheater Wins Hell Gate Suit

The suit of the Babcock & Wilcox Company against the Springfield Boiler Company and the Superheater Company in the United States District Court was decided in favor of the defendants on August 26. The statement of the judge rendering his decision is as follows: "The net result of my examination of the facts in this case is that defendants have constructed a type of superheater water-tube boiler that differs materially from those shown and claimed by the patents in suit, and that it is accomplishing results which, if they were contemplated by Pratt and Bell, are brought about by a construction that avoids any valid claim of infringement of the patents granted upon their inventions. It follows that the complaint must be dismissed."

This suit arose from the fact that in a competition with the plaintiff for the contract to install a boiler plant in the power station of the United Electric Light & Power Company at Hell Gate the defendants were successful and installed boilers and superheaters. The boilers and superheaters installed were claimed by the plaintiff to constitute an infringement of claims 4, 6, 7 and 9 of United States patent to Bell given in 1915 and of claims 1, 2, 4 and 6 of United States reissue patent to Arthur D. Pratt, dated Oct. 1921. Both these patents are owned by the Babcock & Wilcox Company.

Westinghouse Gets Large Southwestern Contract

A contract for the installation of a complete generating and condenser unit of 45,000 hp. has been awarded to the Westinghouse Electric & Manufacturing Company by the U. G. I. Contracting Company of Philadelphia at a cost of more than $500,000. The unit will be installed at the new plant of the Comal Power Company, a subsidiary of the San Antonio Public Service Company, at New Braunfels, Tex.

Robertson-Cataract Reports Good Switchboard Business

The Robertson-Cataract Electric Company, wholesale and retail electrical supply house of Buffalo, Rochester, Syracuse and Utica, N. Y., reports that its switchboard department has since the first of the year enjoyed

the largest six months' business in its history. Orders now on hand, exclusive of any new business which develops, will keep this branch of the company's activities on capacity production well into November. W. E. Robertson, vice-president and general manager, states that he sees an exceptionally good outlook for the electrical business for the next six months.

Habirshaw Cable Elects Board of Directors

Announcement is made of the election of a board of directors for the newly organized Habirshaw Electric Cable Company, consisting of G. H. Walker, president W. A. Harriman & Company, chairman; Fred Leary, Central Union Trust Company, vice-president; E. A. Potter, vice-president Guaranty Trust Company; Malcolm Whitman, William Whitman & Sons; W. G. Smith, W. A. Harriman & Company; F. S. Connett, W. A. Harriman & Company; A. G. B. Steel, Graham, Parsons & Company, Philadelphia; Charles Scribner, Rabenold & Scribner, and John S. Worley, Habirshaw Company. H. G. Cronin is secretary and treasurer. The company will continue with practically no change in the organization, with considerable business on the books and an excellent outlook for the remainder of the year.

Westinghouse Quarterly Report Shows Increase in Orders

According to a statement issued by the Westinghouse Electric & Manufacturing Company, orders received for the quarter ended June 30 totaled $44,432,200, as compared with $40,031,000 for the corresponding period in 1924.

Lincoln Electric Reports Demand for Motors and Arc Welders

The Lincoln Electric Company, Cleveland, reports that in July a heavy demand for electric motors and arc welders was experienced throughout the United States and also in the export fields, according to A. F. Davis, assistant to the general manager. A carload lot of the Lincoln "Linc-Weld" motors has been shipped from Cleveland to distributors in Los Angeles, an order of equal size has just been filled for the Grand Rapids representatives, and another carload lot of motors is being prepared for shipment to the New York warehouse.

The progress being made with electric arc welding in the export fields is said to be illustrated by a large order which has just been filled by the company from its Cleveland factories. Six large "Stable-Arc" welders have been sent to the Burmah Oil Company, at Burmah, India, for use in the oil fields and at the firm's refineries.

The Uehling Instrument Company, Paterson, N. J., has recently appointed two new southern agents to handle its line of CO_2 recorders and other power-plant instruments, namely, John C. Candler, 315 Glenn Building, Atlanta, to cover Georgia, eastern Tennessee and the southern half of South Carolina, and Charles M. Setzer, Charlotte, N. C., to cover North Carolina and the northern half of South Carolina.

The General Electric Company has received an order from the Long-Bell Lumber Company for all the motors required to equip the lumber company's new plant at Longview, Wash. The contract includes 400 motors ranging in size from 3 hp. to 300 hp.

The American Electric Fusion Corporation, 2610 Diversey Avenue, Chicago, manufacturer of electrical apparatus for heating, welding and fusing, announces the first issue of *A. E. F. Welding Illustrated*, which will be published monthly. The paper is intended to contain material of interest to all who are or who may become interested in electric welding.

The Soldo Company, Sicilian House, Southampton Row, London, W. C. I., has recently placed on the market a cleaning, tinning and soldering powder known as "Soldo," by means of which rusty, corroded or painted metal can be tinned by the application of heat on the powder, which itself contains the tin, without any previous cleaning.

The Electric Utilities Manufacturing Company, 1553 Dickson Avenue, Scranton, Pa., has placed on the market a line of regulating portable lamps and wall brackets that can be turned on or off or the brilliancy regulated by the swing of a lever.

The R. H. Buhrke Company, Chicago, manufacturer of linemen's safety belts and straps, tool bags and boxes, etc., announces a change in address to 4538 Fullerton Avenue.

New Equipment Available

Recording Smoke Detector

An electrical recording smoke detector, which will give the boiler operator immediate warning of any tendency of his furnace to cause smoke, has been developed by the Engineering Corporation, 1305 West Broadway, Long Beach, Cal. The instrument consists of an element inserted in the boiler flue which is essentially two plates between which the flue gases pass. These plates are in the primary circuit of a transformer, and in the secondary circuit is placed the sensitive indicating and recording unit, a graphic instrument of the switchboard type. The conductance between the plates of the element increases as the density of the smoke passing between them, causing a flow of charging current which is indicated and recorded by the indicating and recording unit in convenient sight of the boiler operator.

Electric Tructor

An electric tructor designed primarily for use in the sheet and tinplate industry, but also capable of functioning in a broad field, as in the handling of radiators, bales, barrels, motors, pianos, bulky articles, etc., has been placed on the market by the Elwell-Parker Electric Company, Cleveland. In this unit all four wheels steer, so the tructor can be turned on congested floors. All standard Elwell-Parker safety features are incorporated, and all wheel and motor bearings are of the ball or roller type. The unit has a capacity of from 3,000 lb. to 5,000 lb.

Switching Equipment

A gang-operated, remote-control type of underhung disconnecting switch has been developed by the Delta-Star Electric Company, 2433 Fulton Street, Chicago. This switch is of 300 amp. capacity, for operation at 37,000 volts, and permits all phases to be simultaneously opened and closed by means of a common handle which can be placed at any desired point. This arrangement allows the operation of these switches in locations where it would be very difficult and at the same time dangerous to operate them by means of switch sticks.

The company has also developed a 600-amp. 37,000-volt disconnecting switch with each single-pole element, having but two insulators supporting the blades and equipped with self-aligning detachable contacts. It is said that very few parts are used with this switch, and the interlocking mechanism between the single-pole elements is so made that close adjustment is not required when making installation in the field.

Recording Voltmeter

A new high-speed contact-making recording voltmeter, which gives a detailed record of line voltage on a fast moving chart, has been developed by the Bristol Company, Waterbury, Conn. The voltmeter is so designed that the instrument operates only during line disturbances that cause voltage to drop below normal (or a predetermined) point. At all other times the instrument is not recording although it is connected to the system.

Electric Mortiser.—A new portable electrically driven lock mortiser, known as the "Alta" lock mortiser, has been placed on the market by the Wappat Gear Works, Pittsburgh. This machine is said to be very simple and operates rapidly. It is portable, provided with ample protection for the operator, and is driven by a Westinghouse ¾-hp. motor.

Corn Popper.—A new electrically equipped corn popper has been placed on the market by the Valley Manufacturing Company, Des Moines, Iowa. With this device the correct uniform temperature is maintained. The construction of the popping kettle is such that it is unnecessary to remove it from the heat in the dumping and filling operations. The unit is operated by a Westinghouse fractional-horsepower motor.

New Trade Literature

BAKELITE.—The Bakelite Corporation, 247 Park Avenue, New York City, is distributing a folder calling attention to a number of new uses for Bakelite, including handles for electric irons, radio parts, plugs, etc.

ELECTRIC HOISTS.—A folder distributed by the Roeper Crane & Hoist Works, Inc., 1720 North Tenth Street, Reading, Pa., describes its type "R" electric hoists.

DIPPER AND CEILING CUTTER.—Paul W. Koch & Company, 19 South Wells Street, Chicago, is distributing a leaflet calling attention to its "Jiffy" dipper, "Jiffy" ceiling cutter and "Jiffy" loom clamp.

ELECTRICAL APPARATUS.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is distributing its 1925-27 catalog of electrical supplies. It contains 1,200 pages and many illustrations, lists of all new apparatus designed and manufactured in the past two years, as well as all previous established types, and also new apparatus for various industries, including central stations, factories and mines, architects and builders and electric railways. A brief description of its industrial motors and controllers, power and marine equipment, large switchboards, and oil-circuit breakers and railway supplies is given, and four indexes have been included.

PORTABLE AND STATIONARY ELEVATORS.—Catalog No. 106 issued by the New Jersey Foundry & Machine Company, 90 West Street, New York City, describes and illustrates the various types of its "Delta" portable and stationary elevators. It contains a general description of the regular electric elevator. Many illustrations showing typical installations of the "Delta" elevator are included.

TAPPING MACHINES.—The P. E. Chapman Electric Works, corner Tenth and Walnut Streets, St. Louis, has issued bulletin No. 101, covering various types of the Chapman armature and field-coil tapping machines.

LIGHTING GLASSWARE.—Catalog No. 47 issued by the Consolidated Lamp & Glass Company, Coraopolis, Pa., entitled "Lighting Glassware for the Home and Business," describes and illustrates its various types of lighting fixtures for lighting homes, offices, churches, school buildings and commercial lighting.

AUTOMATIC SUBSTATIONS.—The General Electric Company, Schenectady, N. Y., has published bulletin No. GEA-82, describing automatic railway substations. It contains a history of automatic substations, general description of the apparatus, scheme of operation, supervisory control, etc., and a list of typical railway installations, and also a number of illustrations showing various types of stations.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Berlin, Germany (No. 16,422), for internal-combustion engines; (16,369) for electric vacuum cleaners; (16,427) for lubricating equipment for machinery.

An agency is desired in Pretoria, South Africa (No. 16,415), for cables and copper wire, telephone materials and for electric transmission poles.

An agency is desired in Montevideo, Uruguay (No. 16,408), for electrical apparatus and fixtures.

An agency is desired in Rio de Janeiro, Brazil (No. 16,359), for electrical goods.

Purchase is desired in Munich, Germany (No. 16,388), of electrical supplies.

Purchase is desired in Frankfort, Germany (No. 16,420), of household ice machines.

Purchase or agency is desired in London, England (No. 16,436), for insulating materials and fabrics.

Sole agency is desired in Santos, Brazil (No. 16,374), for flashlights, radio sets and parts and broadcasting equipment.

An agency is desired in The Hague, Netherlands (No. 16,433), for electrical machines.

GALVANIZED-STEEL TRANSMISSION-LINE TOWER, WITH CROSS-ARMS, GROUND STUBS, ETC., FOR NEW ZEALAND.—Tenders will be received by the Public Works Department, Wellington, New Zealand, until Sept. 29, for furnishing 560 galvanized-steel transmission-line towers, with cross-arms, ground stubs, etc.

PROPOSED ELECTRIC PLANT FOR MINIEH, EGYPT.—Tenders will be received by the Ministry of the Interior, Cairo, Egypt, until Oct. 1, for furnishing material and construction of electric power station and distribution system in the town of Minieh, Egypt, including Diesel-engine-driven generating units, cables, etc.

ELECTRICALLY DRIVEN PORTAL JIB CRANES FOR CAPE TOWN, SOUTH AFRICA.—Tenders will be received by the Minister of Railways and Harbors, Cape Town, South Africa, until Oct. 1, for furnishing four 4-ton electrically driven portal jib cranes complete.

TWO ELECTRIC TRANSPORTERS FOR VICTORIA (AUSTRALIA) GOVERNMENT RAILWAYS.—Tenders will be received by the Victorian Government Railways Commission, Melbourne, Australia, until Oct. 7 for two electric transporters complete, including electric motors, controllers, operator's trailer, contact wires, insulators, etc.

EGYPTIAN STATE RAILWAYS, TELEGRAPHS AND TELEPHONES.—Manufacturers desirous of being placed on the lists of firms from which tenders for supplies are invited by the Department of Egyptian State Railways, Telegraphs and Telephones are requested to communicate with the general manager of the Department at Cairo, Egypt, by Oct. 15.

TIME CLOCKS AND CALCULAGRAPHS DESIRED IN AUSTRALIA.—Tenders will be received by the Postmaster-General's Department, Melbourne, Australia, until Oct. 27 for time clocks, calculagraphs and switchboards (Cordless), for the Postmaster-General's Department. Tenders will also be received until Oct. 20 for switchboard cable, bells and buzzers and jumper wire.

Construction News

Projects, Plans, Bids and Contracts,
Contemplated or Under Way

New England States

RUMFORD, ME.—The Rumford Falls Power Company plans extensions in its hydro-electric power station, to increase the output about 10,000 hp.

NEWPORT, N. H.—The Brampton Woolen Company has awarded a general contract for the construction of a dye house and an addition to its hydro-electric plant.

CLINTON, MASS.—The installation of a new street-lighting system, consisting of fifty-five lamps, to be maintained by underground wires on Mechanic, High, Water and Main Streets, is under consideration by the town officials. Street-lighting service is furnished by the Clinton Gas Light Company.

GLOUCESTER, MASS.—The Gloucester Electric Company contemplates extensions to its power plant. Charles T. Main, 200 Devonshire Street, Boston, is engineer.

LAWRENCE, MASS.—Negotiations are under way between the City Council and the Lawrence Gas Company for a new street-lighting contract, under which the arc-lamps now in use will be replaced with 400 incandescent lamps of 1,000 cp.

WATERTOWN, CONN.—Plans have been prepared by the Watertown Manufacturing company for a new power plant of 400 hp. capacity.

Middle Atlantic States

BATAVIA, N. Y.—The Western New York Utilities Company plans to erect an addition to its building on Ellicott Street, to be used for general operating service.

BROOKLYN, N. Y.—Bids will be received by the Superintendent of School Buildings, Board of Education, corner of Flatbush Avenue Extension and Concord Street, Brooklyn, until Sept. 2 for mechanical equipment, heating and ventilating apparatus, electric work and lighting fixtures for new Public School 219.

HARRISON, N. Y.—Electric power equiptment will be installed in the proposed local plant to be erected by the Intertype Corporation, 50 Court Street, Brooklyn, to cost about $500,000. The Ballinger Company, 100 East Forty-second Street, New York, is architect.

HERKIMER, N. Y.—The Municial Commission has petitioned the Public Service Commission for permission to erect an electric transmission line on Pine Grove to supply electricity in that section of the town.

HUNTINGTON, N. Y.—The Town Board has authorized the installation of additional lamps on various streets and a number of highways in the town.

NEW YORK, N. Y.—Bids will be received by C. S. White, purchasing agent, New York Central Railroad Company, Room 344, 466 Lexington Avenue, until Sept. 4 for furnishing and erecting complete switchboard equipment for two new circuit-breaker houses and panel changes and additions in two existing circuit-breaker houses, to be covered by Serial Contract No. 22, 1925.

NEW YORK, N. Y.—Bids, it is understood, will soon be asked by the New York Edison Company for the erection of a distributing station at 289 Madison Avenue.

NEW YORK, N. Y.—Bids will be received by Thomas J. Drennan, Fire Commissioner, until Sept. 1 for construction of a portion of the underground fire-alarm system in Long Island City and Astoria, Borough of Queens.

PELHAM, N. Y.—Arrangements have been made by the Village Trustees with the Westchester Lighting Company, Mount Vernon, for the installation of a new street-lighting system in North Pelham. It is proposed to replace all gas lamps with electric lamps throughout the village.

SYRACUSE, N. Y. — The Board of Trustees, Syracuse Memorial Hospital, plans to build a power house in connection with a proposed hospital on Crouse Avenue. John Russell Pope, 542 Fifth Avenue, New York, is architect.

THIELLS, N. Y.—Bids will be received by Frank R. Utter, superintendent of purchase, Capitol, Albany, until Sept. 3 for power instruments for Letchworth Village, Thiells.

WINGDALE, N. Y.—Bids will be received by the State Hospital Commission, Capitol, Albany, until Sept. 16 for construction, heating, sanitary, electric work and refrigeration, Buildings F, G, H, I, J, K, M, O and P, at the Harlem Valley State Hospital, Wingdale. Sullivan W. Jones, Capitol, Albany, is state architect.

TRENTON, N. J.—The Public Service Electric & Gas Company, Newark, plans to build a local substation, to be carried out in connection with a general expansion program in this section, to cost about $2,000,000.

BERWICK, PA.—The American Car & Foundry Company plans to install electric power equipment in connection with proposed additions to its plant, to cost about $230,000.

BRADDOCK, PA. — Arrangements are being made by the United Electric Light Company, Wilmerding, for the construction of an electric plant at Braddock, to cost about $700,000. The contract for equipment has been awarded and will include two 3,125-kva. steam turbo-generators. Work will soon begin on the erection of a 22,000-volt transmission line from the new station to its substation in Wilmerding.

COPLAY, PA. — The City Council is negotiating with the Pennsylvania Power & Light Company, Allentown, for installing a new street-lighting system throughout the city. Ornamental lamps will be installed on some streets.

MARCUS HOOK, PA.—Permission has been granted the Delaware County Electric Company, Chester, to install an underground conduit system on the Post Road and other streets in the city.

NEW CUMBERLAND, PA.—A contract for the installation of twenty-six 400-cp. lamps and forty-one 32-cp. lamps has been awarded to the United Electric Company.

BALTIMORE, MD.—Work will soon begin on a steam-driven electric power plant by the Consolidated Gas, Electric Light & Power Company on Gould Street, with an initial output of 35,000 kw.

PERRY POINT, MD.—Bids will be received by the United States Veterans' Bureau, Room 791, Arlington Building, Washington, D. C., until Sept. 15, for construction complete of kitchen and mess building, including plumbing, heating and electrical work, electric freight elevator, refrigerating plant, etc.

WASHINGTON GROVE, MD. — The Washington Suburban Sanitary Commission plans to install pumping equipment in connection with proposed extensions and improvements to the municipal waterworks

and sewage plants at Gaithersburg and Washington Grove, to cost about $350,000.

HUNTINGTON, W. VA. — Plans have been prepared by the Consolidated Power & Light Company for an addition to its power station, to cost $25,000.

HUNTINGTON, W. VA.—Plans for the proposed new local boiler shop to be built by the Chesapeake & Ohio Railroad Company, at a cost of about $500,000, include a power house. The general contract has been awarded to Milo Hanke, Cincinnati.

PARKERSBURG, W. VA.—Contract has been awarded to the Monongahela West Penn Public Service Company, Fairmont, for the installation of an improved street-lighting system.

WESTON, W. VA.—The Sun Lumber Company plans to install a 300-kw. engine-driven generator, etc., in its power house.

VIRGINIA BEACH, VA.—Arrangements have been made by the Virginia Beach Improvement League for the installation of new lighting system, to cost about $25,000.

WASHINGTON, D. C.—Bids will be received by the Chief of Air Service, United States Army, Washington, until September 15, for 340 ammeters (Circular CAS 12.)

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until September 8, for material for a hydro-electric power plant (Schedule 4257.)

North Central States

LONG LAKE, MICH.—Plans are under consideration to obtain an electric lighting service for Long Lake, a summer resort. It is proposed to make arrangements with an electric light company to extend its lines to this district.

AKRON, OHIO.—The Goodyear Tire & Rubber Company, 120 Broadway, New York, plans to install electric power equipment in the proposed addition to its Plant No. 1, to cost about $750,000.

BELLEFONTAINE, OHIO. — The City Council has authorized improvements to the electric plant, to cost $11,000. The work will include an addition to the power plant and the installation of two new boilers.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until Sept. 4 for high-pressure steam piping for the Division of Light and Power.

CLEVELAND, OHIO. — The Cleveland Electric Illuminating Company, it is reported, is negotiating for the property of the West Claridon Light & Power Company and the municipal plant at Chardon.

AUGUSTA, KY.—Steps have been taken by local business men to secure the installation of an ornamental lighting system.

HARDINSBURG, KY.—The Kentucky-Tennessee Light & Power Company, Guthrie, Ky., is considering extensions in its transmission lines in this district.

PADUCAH, KY.—The Paducah Electric Company is planning extensions and improvements in its power plant, to cost about $75,000.

HAMMOND, IND.—Plans for the proposed local shops of the Union Tank Car Company, 21 East Fortieth Street, New York, to cost about $2,000,000, include a power plant.

CHICAGO, ILL.—Plans have been filed by the International Harvester Company, 606 South Michigan Avenue, for a switch house and transformer station at its plant on Clybourn Avenue.

HILLSBORO, ILL.—Arrangements have been made by the City Commissioners with the Illinois Power & Light Corporation for replacing the present five-lamp clusters in the business district with ornamental standards mounted with single lamps of large candlepower. The new contract also provides for installing ornamental lamps on School Street.

ANTIGO, WIS.—Plans are under consideration by the Wisconsin Valley Electric Company, Wausau, to extend its high-tension transmission line to connect with the system of the Antigo Electric Company, recently acquired by the First Wisconsin Trust Company, Milwaukee.

MANITOWOC, WIS.—Extension of the municipal electric service to the newly annexed sections of the city is under consideration by the Public Utilities Commission.

MENASHA, WIS.—Bids will be received by the City Council until Sept. 1 for a Diesel oil engine of from 600 hp. to 1,000 hp. and one 500-kw. generator complete for the city water and light plant. With addition to power house the cost is estimated at $75,000.

BUHL, MINN.—Bonds to the amount of $100,000 have been issued, the proceeds to be used for extensions and improvements in the municipal electric system.

WINONA, MINN.—Plans have been prepared by the Wisconsin Railway & Light Company, La Crosse, Wis., for extensions to its local plant steam-power plant to house a new 1,000-hp. unit.

CEDAR RAPIDS, IOWA. — The local power plant of the Iowa Railway & Light Company was recently damaged by fire. The loss is estimated at from $15,000 to $35,000.

BAGNELL, MO.—The Missouri Hydro-Electric Power Company has engaged the Burns & McDonnell Engineering Company, Interstate Building, Kansas City, Mo., to prepare plans for a hydro-electric plant near Bagnell, to develop about 100,000 hp. The cost of the plant with transmission system is estimated at $10,000,000.

HANNIBAL, MO.—The installation of an ornamental lighting system on Broadway, from Fifth to Market Street, to cost about $10,000, is under consideration.

ST. JOSEPH, MO. — The Buchanan County Transmission Company contemplates the erection of a 66,000-volt transmission line from a point near Rushville to St. Joseph, to cost about $130,000. J. Barfield, St. Joseph, is engineer.

SYKESTON, N. D.—A bond issue for the erection of a transmission line for local light and power service has been approved by the voters.

GRAND ISLAND, NEB.—The City Council is considering an appropriation of $700,000 for extensions and improvements in the municipal electric plant, ice-manufacturing plant and waterworks. The Pillsbury Engineering Company, Minneapolis, is engineer.

LINCOLN, NEB.—The Eppley Hotels Company, Omaha, plans to build a power plant for the Lincoln and Capital hotels. Cahill & Douglas, 217 West Water Street, Milwaukee, are engineers.

Southern States

ASHEVILLE, N. C.—The installation of pumping equipment in connection with extensions to the municipal waterworks is under consideration by the City Commissioners. Frank L. Conder is engineer.

HIGH POINT, N. C.—The installation of an ornamental lighting system on Main Street is reported to be under consideration.

BLACKSHEAR, GA.—The Ware County Light & Power Company, Waycross, plans extensions in its transmission system in this district.

BARTOW, FLA.—Bonds to the amount of $120,000 for extensions to the municipal electric plant have been approved by the voters.

ORLANDO, FLA.—The Florida Public Service has submitted a proposal to the City Council for the installation of an ornamental lighting system in Orlando. The present plans provide for 700 extra lamp posts to extend from the city limits on the south to the county line north through Maitland to the county line, making the system extend from one end of the county to the other.

SEBASTIAN, FLA. — Bonds to the amount of $50,000 have been approved by the voters, the proceeds to be used for a municipal electric light and power system.

TAVARES, FLA.—The City Council has awarded a contract to the Florida Public Service Company, Orlando, to install an ornamental lighting system here.

ISELIN, TENN.—Electric power equipment will be installed in the proposed local shops to be erected by the Mobile & Ohio Railroad Company, Mobile, Ala., at a cost of about $350,000.

JACKSON, TENN.—Surveys are being made by the Jackson Railway & Light Company for a transmission line from Jackson to Humboldt. Extension will also be made to Brownsville and vicinity.

JOHNSON CITY, TENN.—Plans for the proposed artificial silk mill to be built by the American Bemberg Corporation, 65 Madison Avenue, New York, to cost about $1,500,000, include a power plant. Lockwood, Greene & Company, 24 Federal Street, Boston, are engineers.

McMINNVILLE, TENN.—The Tennessee Electric Company, Chattanooga, which recently acquired the electric plant of the Walling Light & Power Company, is extending its transmission line from its Great Falls generating station at Rock Island to McMinnville, a distance of 18 miles.

ANNISTON, ALA.—The Anniston Cordage Company is planning to build a power house and machine shop.

FLOMATION, ALA. — Permission has been granted to the Gulf Electric Company, Birmingham, to erect an electric transmission line to and a distribution system in Flomation.

OPP, ALA.—The installation of a 360-hp. Diesel engine, auxiliary motor and generator, to cost about $23,000, in its local plant is under consideration by the Pea River Power Company, Troy.

BATON ROUGE, LA.—Bids will be received by the Chamber of Commerce until Sept. 1 for the installation of an ornamental lighting system in the downtown district.

CHURCH POINT, LA. — The Church Point Light, Power & Ice Company plans to build a power plant.

HANNA, OKLA. — Contract has been awarded to the Oklahoma Power Company, Okmulgee, for the installation of an improved lighting system in Hanna.

ABILENE, TEX.—The installation of pumping machinery in connection with extensions to the municipal waterworks, to cost about $250,000, is under consideration by the City Council.

GOOSE CREEK, TEX.—Arrangements are being made by the Houston (Tex.) Lighting & Power Company for the erection of another high-tension transmission line from its deepwater plant on the Ship Channel to Goose Creek, a distance of about 28 miles. In addition to furnishing power for Goose Creek contracts have been made with the Gulf Pipe Line Company and the Humble Oil & Refining Company for furnishing power.

Pacific and Mountain States

CHEHALIS, WASH.—Application has been made by H. W. Crozier of the Cowlitz, Chehalis & Cascade Railway Company and associates for permission for water rights on the Cowlitz River for a hydro-electric project to develop about 16,000 hp. The cost is estimated at about $1,500,000.

SEATTLE, WASH. — Application has been made by the Lilliwaup Power & Water Company, 206 First Avenue, South for water rights on the Lilliwaup River in Mason County, for a proposed hydro-electric plant, to cost about $200,000, including a transmission line.

FILLMORE, CAL.—The City Council is planning to install an ornamental lighting system on Santa Clara Street, Central Avenue, Sespe and other streets, consisting of ninety-three standards.

GLENDALE, CAL.—The City Council is planning to install an ornamental lighting system on Colorado Street from San Fernando Road to Central Avenue, on Glendale and Columbus Avenues and Verdugo Road, using double-lantern metal standards.

LOS ANGELES, CAL.—Bids will be received by the Board of County Supervisors until September 8, for an electric signal system in Building No. 20, Los Angeles general hospital; lighting fixtures for the Patriotic Hall, and lighting fixtures for the new Hall of Justice. Plans and specifications are on file at the office of the mechanical department, tenth floor, Hall of Records.

SAN MARINO, CAL.—The City Council has authorized the installation of ornamental lamps on the Plymouth Road, between Los Robles and El Molino Avenues.

LEWISTON, IDAHO.—Plans are being prepared by the Inland Power & Light Company for a local hydro-electric plant, to develop about 13,300 hp.

ISMAY, MONT.—The City Council is considering a bond issue of $9,000, the proceeds to be used for the installation of a municipal lighting system.

PLEVNA, MONT.—Bonds have been authorized for the installation of a municipal electric light plant.

Canada

VEGREVILLE, ALTA.—Bids, it is reported, will be asked by the town clerk for an oil engine and addition to power plant.

HAMILTON, ONT.—The International Harvester Company has contracted with the Hydro-Electric Power Commission at Hamilton for electrical power to the amount of 2,000 hp. for its works at Hamilton.

COATICOOK, QUE.—Plans are being prepared by R. S. and W. Lea, 340 University Street, Montreal, for a municipal power development, to cost about $180,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued July 21, 1925)

1,546,886. SWITCH OPERATING MECHANISM; C. E. Canfield, Pittsfield, Mass. App. filed May 17, 1923. Ratio adjusting switch for oil immersed transformer.

1,546,889. RELAY; P. R. Fortin, Schenectady, N. Y. App. filed June 9, 1922. Adapted to be operated by weak currents such as for signaling purposes.

1,546,899. METHOD AND APPARATUS FOR TRANSFORMING CRYSTALLINE STRUCTURES OF DRAWN TUNGSTEN WIRES. App. filed July 6, 1922.

1,546,900. CONTROL SYSTEM FOR ELECTRIC MOTORS; B. W. Jones, Schenectady, N. Y. App. filed Nov. 23, 1923. For insuring the starting of the motor with a predetermined initial torque.

1,546,908. ELECTROENDOSMOSIS METHOD AND APPARATUS; V. A. Lapenta, Indianapolis, Ind. App. filed Jan. 22, 1925.

1,546,981. LAWN MOWER; R. Harris, San Diego, Cal. App. filed Jan. 16, 1923. Electrically driven.

1,547,000, 1,547,001, 1,547,002. ELECTRIC FURNACE; A. Ruckstahl, Detroit, Mich. App. filed May 11, 1922. For the treatment of material at high temperatures.

1,547,009. ELECTRIC SWITCH; C. E. Anderson, Stratford, Conn. App. filed June 11, 1924. Momentary contact type.

1,547,124. X-RAY APPARATUS; A. S. Kalenborn, San Francisco, Cal. App. filed March 9, 1921. Embodying the use of extra high potential X-ray tubes.

1,547,143. VARIABLE RESISTANCE; F. B. Cox, Liverpool, England. App. filed July 9, 1924. Resistance and control switch.

1,547,145. ELECTRIC SAFETY SWITCH AND PLUG COUPLING; A. W. Lundstrom, New York, N. Y. App. filed April 17, 1923.

1,547,152, 1,547,153, 1,547,154. AMPLIFYING APPARATUS; A. W. Hull, Schenectady, N. Y. App. filed Aug. 15, 1924. For high-frequency signaling currents.

(Issued July 28, 1925)

16,126 (reissue). ELECTRIC MACHINE; M. Schuler, Neumuhlen, Germany. App. filed Nov. 17, 1924. Run in hydrogen, the physical constants of which are much more favorable than those of the air.

1,547,160. NOVELTY ARTICLE; F. A. Bailey, Toledo, Ohio. App. filed May 7, 1923. Bedroom night lamp holding a quantity of perfume or other preparation heated by the lamp to scent the room.

1,547,180. ELECTRIC LAMP; T. J. Murphy, New York, N. Y. App. filed June 7, 1920. Tri-electrode inclosed arc lamp.

1,547,217. PHRASE REGULATOR FOR MULTI-FREQUENCY GENERATORS; J. Herman, New York, N. Y. App. filed July 11, 1924.

1,547,220. TREE INSULATOR; A. W. Kipp, Leominster, Mass. App. filed Dec. 15, 1924.

1,547,232. MULTIPLEX SIGNALING SYSTEM; R. D. Parker, Brooklyn, N. Y. App. filed Sept. 8, 1919. Carrier-current type.

1,547,242. CARRIER TRANSMISSION OVER POWER CIRCUITS; M. E. Strieby, Millburn, N. J. App. filed April 29, 1924.

1,547,274. WINDING MACHINE; R. Farley, Englewood, N. J. App. filed Feb. 9, 1924.

1,547,314. CONNECTOR; H. Frankel, New York, N. Y. App. filed July 8, 1921. Between a source of electrical supply and a storage battery.

1,547,320. MEANS FOR MOUNTING OR SUPPORTING INCANDESCENT-LAMP SOCKETS OR OTHER ELECTRICAL OUTLETS; J. Hamilton, Boston, Mass. App. filed Sept. 24, 1919.

1,547,342. MAGNETO; E. B. Nowosielski, Bloomfield, N. J. App. filed July 2, 1921.

1,547,351. ELECTRIC HEATER; P. Schwerin, New York, N. Y. App. filed Nov. 19, 1921. Heating vacuum tubes during pumping.

1,547,362. APPARATUS FOR THE ELECTROLYSIS OF WATER; L. Casale, Rome, Italy. App. filed July 19, 1922. For the production of hydrogen and oxygen.

1,547,363. METHOD FOR TREATING CONDUCTORS; A. A. Catlin, East Orange, N. J. App. filed Oct. 31, 1919.

1,547,382. THERMOSTATIC ELECTRIC MOTOR PROTECTION; A. E. Gourdier, C. B. Eggleston and G. M. Gourdier, Santa Cruz, Cal. App. filed Jan. 13, 1922.

1,547,392. MEANS FOR REPRODUCING POSITION; E. M. Hewlett and W. W. Willard, Schenectady, N. Y. App. filed Aug. 2, 1923. For controlling a remote driving motor.

1,547,394. LEADING-IN WIRE FOR ELECTRICAL INCANDESCENT LAMPS AND SIMILAR DEVICES; S. L. Hoyt, East Cleveland, Ohio. App. filed Aug. 2, 1921.

1,547,395. SEALING-IN WIRE; S. L. Hoyt, Cleveland, Ohio. App. filed Nov. 30, 1921. For leading-in wires for electric incandescent lamps and other electrical devices.

1,547,407. MAGNETIC BLOW-OUT DEVICE; V. Breeze, Brighton, England. App. filed July 12, 1921.

1,547,422. ELECTRIC HAIR CLIPPER; M. H. Kotzebue, Tulsa, Okla. App. filed May 18, 1922.

1,547,435. MEANS FOR REPRODUCING POSITION; A. H. Mittag, Schenectady, N. Y. App. filed July 20, 1923. For controlling a remote driving motor of the alternating-current type.

1,547,441. AUTOMOBILE TRAFFIC SIGNAL; F. Peterlin and H. W. Fehr, Denver, Col. App. filed Nov. 22, 1921.

1,547,442. TIME-CONTROLLED ELECTRIC SWITCH; O. H. Pieper and A. F. Pieper, Rochester, N. Y. App. filed Feb. 14, 1921.

1,547,447. STORAGE BATTERY; R. D. Rifkin, St. Louis, Mo. App. filed Aug. 30, 1923. Insulating the positive and negative plates of a battery from each other.

1,547,497. LOW-VOLTAGE HEAVY-CURRENT TRANSFORMER; T. M. Hunter, Newark, N. J. App. filed Feb. 15, 1924.

1,547,507. INDUCTANCE COIL; A. Leib, Berlin, Germany. App. filed April 29, 1924.

1,547,539. PROCESS FOR INCREASING THE LIFE OF GRAPHITE OR CARBON ELECTRODES; A. Von Antropoff, Karlsruhe, Germany. App. filed Dec. 8, 1922.

1,547,574. APPARATUS FOR SOUNDING; R. D. Fay, Nahant, Mass. App. filed May 2, 1921. Submarine signaling.

1,547,575. METHOD OF SOUNDING; R. D. Fay, Nahant, Mass. App. filed May 2, 1921. Submarine signaling.

1,547,576. COIL ATTACHMENT; W. T. Ferguson, St. Paul, Va. App. filed Oct. 27, 1924. Vibrator coil attachments

1,547,580. CABLE FOR ELECTRICAL MACHINES ADAPTED TO BE COILED AND UNCOILED; E. A. Grafstrom, Stockholm, Sweden. App. filed May 14, 1919.

1,547,615. CURRENT COLLECTOR; W. Schaake, Pittsburgh, Pa. App. filed March 15, 1922. For trackless trolley vehicles.

1,547,623. ELECTRIC FURNACE; E. L. Smalley, South Orange, N. J. App. filed Aug. 11, 1922.

1,547,632. THERMAL RELAY; R. J. Wensley, Edgewood Park, Pa. App. filed Oct. 29, 1920.

1,547,647. ELECTRIC HEATER; N. Furfaro and R. L. Rockwell, Seattle, Wash. App. filed Jan. 31, 1924.

1,547,659. VOLT-AMPERE METER; B. E. Lenehan, Wilkinsburg, Pa. App. filed May 7, 1924.

1,547,661. SYSTEM OF CONTROL; R. W. McNeill and G. R. Shaw, Wilkinsburg, Pa. App. filed Sept. 12, 1921. For dynamo-electric machines; has special relation to the electric control of a motor-driven-shovel equipment.

1,547,665. METHOD AND APPARATUS FOR GENERATING ELECTRONIC DISTURBANCES; C. M. Page, Geneva, Ill. App. filed June 23, 1923.

1,547,684. OSCILLATION GENERATOR AND JOINT OPERATION THEREOF; H. C. Rentschler, Pittsburgh, Pa. App. filed Aug. 17, 1920.

1,547,689. CHANGING OF POLE CONNECTIONS OF FOUR-PHASE WINDINGS; R. Rudenberg, Berlin-Grunewald, Germany. App. filed Dec. 15, 1920.

1,547,693. OVERLOAD SWITCH; L. Schon and J. Pfretzschner, Essen, Germany. App. filed Sept. 4, 1920.

1,547,699. ELECTRICAL SWITCH; L. J. Voorhees, Binghamton, N. Y. App. filed July 1, 1921. For portable electric lights.

1,547,701. DOUBLE-BULB BALLAST LAMP; P. T. Weeks, Caldwell, N. J. App. filed June 25, 1921.

1,547,723. ELECTRICAL MEASURING INSTRUMENT; M. E. Berlowitz, Belleville, N. J. App. filed June 27, 1917. Direct-current instruments of the moving-vane type.

1,547,728. POWER-FACTOR REGULATOR; C. A. Boddie, Pittsburgh, Pa. App. filed Dec. 3, 1919.

1,547,730. TWO-SPEED ALTERNATING-CURRENT ELEVATOR CONTROL; E. M. Bouton, East Pittsburgh, Pa., and R. P. Higbee, Wilkinsburg, Pa. App. filed Oct. 11, 1922.

1,547,745. CONTROL SWITCH FOR HEADLIGHTS; M. Goodrich, Charlotte, Mich. App. filed Nov. 11, 1922.

1,547,747. INCANDESCENT ELECTRIC LAMP; J. C. Grogan, Newark, N. J. App. filed Jan. 24, 1921. Of the miniature type.

1,547,753. PROCESS OF TREATING METAL; W. G. Houskeeper, New York, N. Y. App. filed Aug. 30, 1920. An electric oven.

1,547,760. ELECTRON-DISCHARGE DEVICE; R. W. King, New York, N. Y. App. filed July 22, 1919.

1,547,769. FUSE HOLDER; L. W. McOmber, South Milwaukee, Wis. App. filed July 9, 1920.

1,547,803. TIME SWITCH; G. F. Gavard, Los Angeles, Cal. App. filed Nov. 16, 1923.

1,547,812. VACUUM TUBE AND METHOD OF MANUFACTURING SAME; W. F. Hendry, New York, N. Y. App. filed Sept. 4, 1919.

1,547,824. SADIRON; C. H. Roehm, West New York, N. J. App. filed Aug. 10, 1923.

1,547,825. HANDLE AND SWITCH FOR ELECTRIC HEATING ELEMENTS; C. H. Roehm, West New York, N. J. App. filed May 22, 1924.

1,547,835. ELECTRICAL CONTROLLING MECHANISM; H. E. Stahl, Trenton, N. J. App. filed Sept. 23, 1922.

1,547,844. SERVO-MOTOR; H. L. Tanner, Brooklyn, N. Y. App. filed June 28, 1921. For use in connection with instruments having moving parts which require frequent reversal.

1,547,850. RELAY ARRANGEMENT; P. Klaas van der Sterr and A. P. Bender, Frankfort-on-the-Main, Germany. App. filed Aug. 29, 1921.

1,547,858. CONTROL SYSTEM; S. H. Cowin, Edgewood Park, Pa. App. filed Nov. 12, 1920. Operation of liquid rheostats.

1,547,873. SIGNALING SYSTEM; R. M. Hopkins, Rutherford, N. J. App. filed March 13, 1918. Alarm or detection systems.

1,547,883, 1,547,884. ELECTRIC SWITCH; J. F. Lindberg, Chicago, Ill. App. filed June 19, 1922, and Aug. 30, 1922.

1,547,886. ELECTRIC SIGN FLASHER; P. V. McCash, Seattle, Wash. App. filed April 4, 1923. Automatic make- and break-mechanism.

1,547,909. WARNING-SIGNAL SYSTEM; R. R. Earle, San Francisco, Cal. App. filed Aug. 28, 1922.

1,547,972. COUPLING FOR STEEL-ALUMINUM ROPES; O. Spannaus, Cologne-Mulheim, Germany. App. filed Aug. 8, 1922.

1,548,006. ELECTROMAGNETIC CIRCUIT CONTROLLER; B. W. Jones, Schenectady, N. Y. App. filed Sept. 9, 1921.

(Issued August 11, 1925)

1,548,826. HEAT COIL; H. D. Currier, Chicago, Ill. App. filed April 15, 1920. Thermal overload cut-out.

1,548,828. ELECTRIC HEATER; J. C. Donelan, Springfield, Ill. App. filed Nov. 11, 1924. Small heaters such as are used by dentists in laboratory work.

1,548,840. ELECTRODE FOR ELECTROLYTIC DECOMPOSITION APPARATUS; C. F. Homboe, Riis, near Christiania, Norway. App. filed July 23, 1924.

1,548,856. STRAIN INSULATOR; L. Steinberger, Brooklyn, N. Y. App. filed Sept. 23, 1921.

1,548,858. METHOD OF ELECTRICAL WELDING; A. C. Taylor, Warren, Ohio. App. filed Feb. 3, 1923. For spot-welding metal sheets or other parts.

1,548,862. INTERFERENCE-NEUTRALIZING ARRANGEMENT; O. B. Blackwell, Garden City, N. Y. App. filed Aug. 14, 1920. In a signaling system.

1,548,873. TELEGRAPH SIGNALING SYSTEM; J. M. Fell, Hackensack, N. J. App. filed March 15, 1920. Means for applying the duplex and half-duplex methods of operation to local loop circuits

1,548,874. TELEGRAPH SIGNALING SYSTEM; J. M. Fell, Hackensack, N. J. App. filed March 15, 1920. For preventing the reaction between the polar relays of a duplex system.

1,548,878. ELECTRICAL SIGNALING SYSTEM; D. K. Gannett, Arverne, N. Y. App. filed April 19, 1920. To suppress effect upon receiving apparatus of very low-frequency disturbances that may be set up.

1,548,883. ELECTRIC SWITCH AND TEST DEVICE; B. D. Horton, Detroit, Mich. App. filed April 22, 1913. Service and meter-test device.

1,548,895. ELECTRICAL TRANSMISSION OF PICTURES; P. Mertz, Ithaca, N. Y. App. filed Jan. 26, 1923.

1,548,943. ELECTRICAL CIRCUITS FOR MOTION-PICTURE PROJECTORS; N. B. Green, Rochester, N. Y. App. filed Jan. 13, 1922.

1,548,947. TELEGRAPH SYSTEM; R. A. Heising, Millburn, N. J. App. filed May 29, 1922. Multiplex high-speed system.

1,548,952. ELECTRIC CONTROL CIRCUITS; J. Mills, Wyoming, N. J. App. filed Nov. 4, 1921. To suppress variations in a source of direct current.

1,548,953. ELECTRICAL HEATING DEVICE; A. A. Nims, Bloomfield, N. J. App. filed March 15, 1924. For heating containers.

1,548,959. CONTROL REGULATOR; H. M. Stoller, Mountain Lakes, N. J., and E. R. Morton, New York, N. Y. App. filed July 3, 1924. For a motor-generator set.

1,549,005. ELECTRIC POWER SYSTEM; J. J. Kane, Milwaukee, Wis. App. filed Feb. 2, 1920. Variable loads, especially where there is a tendency for the generator driving means to operate at a speed dependent upon the load.

Financial and Corporate

Utility Market Quiet

Heavy Speculation Checked—Recessions in Price Changes Predominate

NOTHING out of the ordinary developed in the market for power and light stocks during the past week. A definite check seems to have been administered to speculation, which a few weeks ago was in full swing. Although further recessions predominated in the list of price changes, the procedure of correcting the technical structure of the market was orderly throughout. Rallying power was displayed by many issues at intervals, but buying lacked aggressiveness and the improvement failed to hold. Nevertheless, it was evident from the manner in which the list resisted selling pressure that there was still a good demand in the market.

The note of caution sounded by Samuel Insull little more than a fortnight ago still appeared to be fresh in the minds of prospective purchasers, who without exception showed little inclination to bid for shares. On the other hand, the selling which his message had induced apparently had run its course, and incidentally the list was restored to a much firmer basis. From an investment point of view the publication of the balance sheet of the North American Company showing the position of that corporation at the close of the calendar half year was the most interesting development of the week, indicating further progressive expansion and a much stronger current position.

As far as price movements were concerned, Adirondack Power & Light was an exception to the general rule, moving against the trend for a net gain of seven points. Strength here was offset by losses of one to four points in many other issues. Southeastern Power & Light new stock on a when-issued basis was inclined to sag sharply, losing about four points. Shares of the recently organized Mohawk & Hudson Power Corporation also were noticeably heavy. Among the utilities on the New York Stock Exchange Havana Electric Railway, Light & Power rushed ahead sensationally in response to fresh buying for control.

Central States Electric Makes New Offering

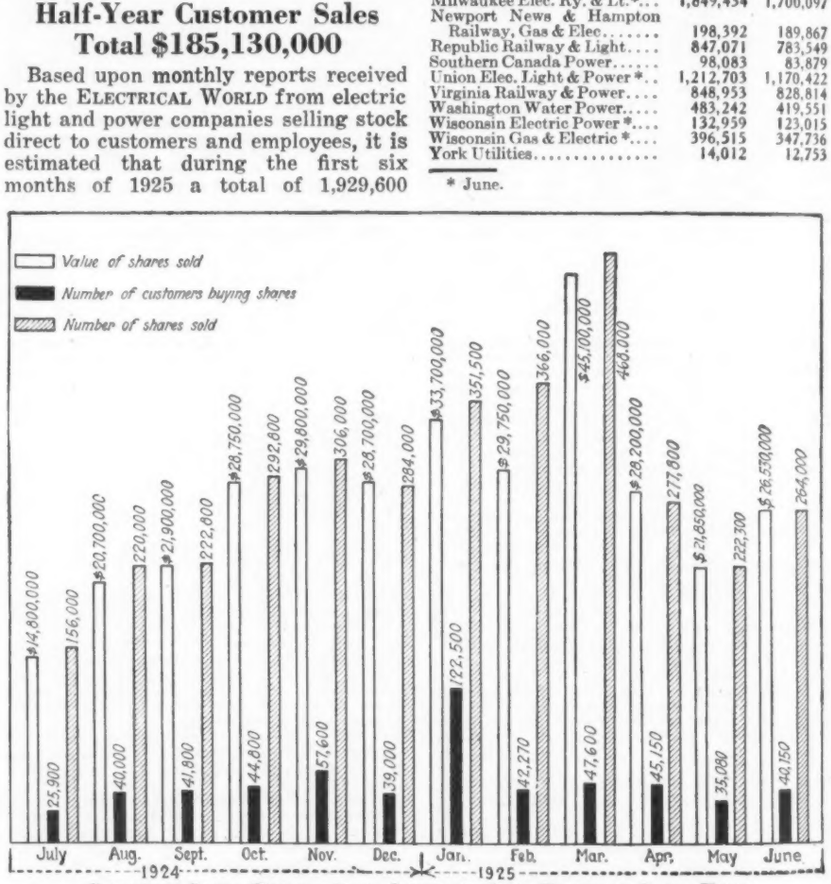
In order to refund in part existing obligations and to provide additional funds for corporate purposes, the Central States Electric Corporation recently made an offering of 7 per cent cumulative preferred stock amounting to $3,000,000. The corporation offered on or before August 20 to the holders of 7 per cent cumulative preferred stock and common stock of record August 8 thirty thousand shares of this 7 per cent stock at $98 per share flat. Each stockholder was entitled to subscribe for one share of preferred for each five shares of common or preferred stock held.

During the past week a public offering was made of the unsold portion of this issue through A. B. Leach & Company, the price being 98 to yield 7.22 per cent.

Half-Year Customer Sales Total $185,130,000

Based upon monthly reports received by the ELECTRICAL WORLD from electric light and power companies selling stock direct to customers and employees, it is estimated that during the first six months of 1925 a total of 1,929,600 shares of stock, valued at $185,130,000, was sold in this manner. The total financing of the industry during this period, including sales of securities by investment houses, was $783,073,000. The above figures indicate that 23.6 per cent of this amount was sold by the operating companies direct to customers and employees. The largest customer sales were recorded in March, when 468,000 shares of stock, valued at $45,100,000, were sold.

During June a total of 264,000 shares of stock, valued at $26,530,000, was sold to customers. Forty thousand one hundred and fifty customers participated in these sales. In June, 1924, stock valued at $24,000,000 was sold in this manner, but only 14,600 customers participated in the sales. The twelve-month period has witnessed a much wider distribution of sales among customers.



CUSTOMER SALES DURING JUNE INCREASE OVER THOSE OF LAST YEAR

Company Reports

The following statements of earnings were issued during the past week by electric light and power companies for the month of July:

Name of Company	Gross Earnings for July — 1925	1924
Alabama Power	$999,067	$676,410
Central Maine Power System	326,299	283,408
Jamaica Public Service *	50,981	46,240
Milwaukee Elec. Ry. & Lt.*	1,849,434	1,700,097
Newport News & Hampton Railway, Gas & Elec.	198,392	189,867
Republic Railway & Light	847,071	783,549
Southern Canada Power	98,083	83,879
Union Elec. Light & Power *	1,212,703	1,170,422
Virginia Railway & Power	848,953	828,814
Washington Water Power	483,242	419,551
Wisconsin Electric Power *	132,959	123,015
Wisconsin Gas & Electric *	396,515	347,736
York Utilities	14,012	12,753

* June.

Dividends Declared

The quarterly dividends listed below were announced during the past week by electric light and power companies and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
Barcelona Trac., Lt. & Pwr., 7% pf.	1¾	Sept. 30
Buffalo, Niagara & East. Power, pf.	.40	Oct. 1
Calumet Gas & Elec., pf.	1¾	Sept. 17
Cleveland Elec. Illum., 6% pf.	1½	Sept. 1
El Paso Electric, com.	$1.25	Sept. 15
Galveston-Houston Elec., pf.	3	Sept. 15
Georgia Railway & Elec., com.	2	Aug. 20
Grafton Co. Elec. Lt. & Pwr., pf.	2	Sept. 1
Kentucky Hydro-Elec., pf.	1¾	Sept. 21
National Power & Light, pf.	$1.75	Oct. 1
North American Co., pf.	1¾	Oct. 1
North American Co., com.	2½	Oct. 1
Northwestern Public Service, pf.	1¾	Sept. 1
Pennsylvania-Ohio Elec., pf.	1¾	Sept. 1
Southern Colorado Power, pf.	1¾	Sept. 15
Canadian General Elec., pf.	1¾	Oct. 1
General Electric, com.	2	Oct. 15
General Electric, com. *	..	Oct. 15
General Electric, special	.15	Oct. 15

* Payable in special stock. One share for each two shares of common.

Mohawk-Hudson Power Company Stock Increase.—On August 1 the Mohawk-Hudson Power Company filed a certificate at Albany, N. Y., increasing its authorized capital stock from 350,000 to 2,150,000 shares of no par value.

Western Electric to Call Stock.—The Western Electric Company will call on September 15 all its outstanding preferred stock. There is outstanding a total par value of $24,679,600 against an authorized amount of $50,000,000. Stock is callable at $110 a share.

Maytag Stock Sold Out.—Two hundred and fifty thousand shares of no-par common stock of the Maytag Company, placed on the market this week by Hornblower & Weeks, were reported all sold by 10 a.m. Tuesday at $20 per share. The total capitalization of the company is 1,600,000 shares. The bankers state that since 1922, when all the output of the Maytag company was consolidated into one product, the company has been unable to keep production up to the demand. The capacity of the factory has been increased from 400 machines per day to 800, and additions now under way will make possible 1,500 per day next year. It is announced that the stock will at once be placed upon a $2 dividend basis.

Continental Gas & Electric to Sell Securities in Missouri.—The "Blue Sky" Commission of Missouri in an order dated August 11 has authorized the Continental Gas & Electric Corporation to sell its securities in Missouri. This ruling sets aside two previous orders of the former Commissioner of Finance, one dated February 26, 1924, and the other dated April 18, 1924, refusing to authorize the sale of Continental securities in the state.

American Superpower Adds to Holdings.—The American Superpower Corporation, organized less than two years ago to purchase stocks in public utilities and to engage in other activities in the public utility field, has just acquired some stock of the Middle West Utilities Company, controlled by Samuel Insull and associates. This latest purchase gives American Superpower an interest in nineteen companies.

Toho Electric Power Reports Increased Earnings.—The report of the Toho Electric Power Company, Ltd., of Japan, for the semi-annual fiscal period ended April 30, 1925, has been received by the Guaranty Company of New York, the company's bankers in this country. The earnings for the first half of the fiscal year amounted to $8,158,180, compared with $7,949,709 for the preceding half year. These figures have been translated into dollars at the rate of 41 cents per yen, approximately the present rate of exchange.

Consumers Power Report.—The annual report of the Consumers Power Company, Jackson, Mich., for the year ended December 31, 1924, shows gross earnings of $18,328,150, compared with $16,877,422 for 1923. Net income after depreciation, etc., amounted to $4,791,727, equivalent after preferred dividends to $2.61 a share on the 1,246,301 shares of no-par common stock outstanding, compared with $4,415,717, or $2.60 a share, on the common stock, as computed on the present capitalization for the preceding year. Operating expenses increased from $7,588,523 in 1923 to $7,824,979 in 1924, though the ratio to gross earnings dropped from 44.96 to 42.69. The balance sheet as of December 31, 1924, shows current assets of $5,905,694 and current liabilities of $3,318,957, leaving net working capital of $2,586,737 as compared with $2,237,529 as of December 31, 1923.

Manila Electric Announces Changes in Board.—As a result of the acquisition of a controlling interest in the Manila Electric Corporation by the Associated Gas & Electric Company a new board of directors has been elected for the Manila organization. The new board, including representatives of the Associated Gas & Electric Company, consists of the following: J. M. Daly, C. A. Greenidge, H. C. Hopson, S. J. Magee, J. I. Mange, T. W. Moffat and W. C. Wishart, in place of W. C. Burton, A. N. Connett, R. Walter Lee, R. B. Marchant, Charles M. Swift, Samuel S. Swift, J. Dugald White and J. G. White, resigned.

General Electric to Retire Bonds.—The General Electric Company, according to an announcement of its president, Gerard Swope, on September 1 will retire the entire outstanding issue of its 5 per cent gold debenture bonds of 1912, due September 1, 1952, and amounting to $15,136,500. In 1921 the company owed $46,000,000 on notes and $35,000,000 on bonds issued. Between January, 1923, and December 31, 1924, the company paid off $18,000,000 of its bonds so that by September 1, 1925, the company's funded debts will have been reduced to $2,000,000, all of the notes having been paid off three or four years ago. In less than five years the General Electric will have reduced its debt from $81,000,000 to $2,000,000, a reduction of 97½ per cent.

Associated Gas & Electric Expands

Addition of Pennsylvania Electric Corporation, or "Penn Public System," to Its Properties Swells Associated Assets to $175,000,000 and Earnings to $24,000,000

BY PAUL WILLARD GARRETT

ONE of the largest power deals of the year took place a fortnight ago when the Associated Gas & Electric Company purchased control of the Pennsylvania Electric Corporation, and thus of the "Penn Public System," from the H. D. Walbridge & Company interests. Since the "Penn Public System" serves an area approximating one-sixth of the State of Pennsylvania, extending the full width of the state from Erie on the north to Somerset on the south and over the border into Maryland, the purchase will greatly enlarge the Associated Gas & Electric Company's sphere of activity. It brings together public utility properties under Associated management having assets in excess of $175,000,000 and gross annual earnings exceeding $24,000,000.

The "Penn Public System" has two large hydro-electric plants with 48,000 hp. installed capacity, the Clarion River Hydro-Electric Plant in Pennsylvania and the Youghiogheny River Hydro-Electric project in Maryland. In addition to several smaller steam plants, the company has two large modern steam generating stations, the Seward station plant near Johnstown and the Front Street station at Erie. Discontinuance of production of large quantities of energy in the smaller plants and increased production at the large stations will, it is reckoned, effect a saving of roughly a million dollars a year in the cost of generation. The hydro-electric plants are equipped with dams and storage reservoirs so that a uniform power supply may be maintained throughout the year regardless of rainfall.

The J. G. White Management Corporation for years has been the operating manager of the Associated properties, which, incidentally, now must be named among the larger properties in the utility field. A consolidation of the earnings of all properties now to be in the Associated group reveals a steady gain in gross from $17,958,891 in 1921 to $24,165,807 for the twelve months ended May 31, 1925. Net earnings in the same period have grown from $5,845,922 to $10,439,544. The Associated Gas & Electric Company is supposed to have paid $100 a share for its investment in Pennsylvania Electric Corporation stock, but holders of the latter shares may, if they chose, take payment in the form of securities. To that end the Associated company recently has issued new 6½ per cent interest-bearing option warrants, $35 paid, which carry detachable rights to purchase common stock.

Describing these warrants, President J. I. Mange recently said: "The 6½ per cent interest-bearing option warrants will be deliverable on or about September 15, 1925, on payment of $35 per warrant. When fully paid, but not before September 1, 1926, unless anticipated by the company, the holders will receive one-half share of common stock and either $100 principal amount of 6 per cent convertible debenture bonds or one share of $6.50 dividend series preferred stock, with adjustment for accrued interest on debenture bonds or accrued dividends on preferred stock. The warrants will be fully registerable and transferable. . . . The option warrants will carry detachable stock purchase rights entitling the holder thereof to purchase one share of common stock after March 1, 1926, and on or before September 1, 1927, for $20, or thereafter and on or before September 1, 1930, for $30."

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stocks is $100.)

Companies	Bid Price Saturday, Aug. 22	Low 1925	High 1925
PREFERRED STOCKS			
Operating Companies			
Adirondack Pwr. & Lt.—7%	100	98	106
Adirondack Pwr. & Lt.—8%	108	103	115
Appalacoian Pwr.—7%	98	92	100
Appalachian Pwr. 1st pf.—7%	100	95	101
Arizona Pwr.—7%	79	75	87
Arkansas Lt. & Pwr.—7%	98½	92	102
Asheville Pwr. & Lt.—7%	f101½	101	102½
Central Ill. Pub. Serv.—6%	85	84	93
Cleveland Elec. Illg.—6%	102	101	105
Colo. Pwr.—7%	95	93	98
Conn. Lt. & Pwr.—8%	115	115	118
Conn. Lt. & Pwr. —7%	106	105	110
eCon. Gas, El. Lt. & Pwr.—6½%	110¼	105	110¼
Cons. Gas, El. Lt. & Pwr.—8%	124	123	126
Cons. Gas, El. Lt. & Pwr.—7%	109	108	112
Consumers' Pwr.—6%	94½	90	97
Dayton Pwr. & Lt.—6%	94	88	100
Dubuque Elec.—6%	90	80	90
Duquesne Lt.—7%	109	105	111¾
East. Tex. Elec.—6%	100	100	105
Empire Dist. Elec.—6%	78	78	85
Ft. Worth Pwr. & Lt.—7%	f102	101½	103
Georgia Ry. & Pwr.—4%	95	62	90
Gt. West. Pwr.—7%	99	....	....
Ia. Ry. & Lt.—7%	97	92	100
Ill. North. Utilities—6%	88	82	92
Ill. Pwr. & Lt.—7%	95½	92½	98
Interstate Pub. Serv.—7%	96	90	100
Kans. Gas & Elec.—7%	f102	101½	103
Long Island Lighting—7%	104	100	105
Los Angeles Gas & Elec.—6%	94	90	97
Milwaukee Elec. Ry. & Lt.—8%	100	98	105
Milwaukee Elec. Ry. & Lt.—7%	97½	96	105
Milwaukee Elec. Ry. & Lt.—6%	86	83½	87
Minn. Pwr. & Lt.—7%	f100	100	101
Miss. River Pwr.—6%	92	87½	94
Nebraska Pwr.—7%	102½	102	103½
N. J. Pwr. & Lt.—7%	f102	92	102
New Orleans Pub. Serv.—7%	99	94	102
N. Y. Central Elec.—7%	100	96	101
Niagara Falls Pwr.—7%—25	28½	27¾	29
Niagara, Lock. & Ont. Pwr.—7%	107	101½	110
No. Caro. Pub. Serv.—$7—no par	91	90	96
No. Ohio Trac. & Lt.—6%	73	64	75
North. States Pwr.—7%	100	95	100
Ohio Gas & Elec.—7%	90	87	100
Ohio Pwr.—6%	91	85	95
Ohio Pub. Serv.—7%	97	97	100
Pac. Gas & Elec.—6%	96	92	99
Pac. Pwr. & Lt.—7%	f101½	101	102½
cPenn Central Lt. & Pwr.—no par	70½	60	70½
Penn-Ohio Pwr. & Lt.—7%	93	91	100
Penn-Ohio Pwr. & Lt.—8%	104	101	110
Penn. Pub. Serv.—7%	90	90	100
Penn Pub. Serv.—6%	80	80	90
Penn. Pwr. & Lt.—$7—no par.	f103½	103½	104½
cPhila. Elec.—8%—25	45	37½	47¾
Portland Elec. Pwr.—7%	97	95	99
Portland Elec. Pwr.—6%	68	70	80
Pwr. Corp. of N. Y.—7%	99	96	102
Pub. Serv. of No. Ill.—6%	108	90	97
Pub. Serv. of Okla.—7%	94	87	95
Pub. Serv. Elec. & Gas—6%	f 97½	92½	97⅛
Puget Sound Pwr. & Lt.—7%	102	102½	107
Rochester Gas & Elec.—5%	105	80	98
So. Calif. Edison—8%	127	115	128
So. Calif. Edison—7%	109	105	107½
So. Calif. Edison—6%	96	90	95½
Tenn. Elec. Pwr.—6%	85	80	85
Tenn. Elec. Pwr.—7%	98½	93	103
Tenn. Elec. Pwr.—$6—no par	80	72	84
Tex. Pwr. & Lt.—7%	f102½	102	104
Toledo Edison—8%	110	109	114
Toledo Edison—7%	101	94	101½
Utah Pwr. & Lt.—7%	f100½	100	101½
Utica Gas & Elec.—7%	101	100	104
Vermont Hydro-Elec.—7%	90	87	96
Virginia Pwr.—7%	102	94	107
West Penn—7%	98½	94	100
West. States Gas & Elec.—7%	89	82	92
Wis.-Minn. Lt. & Pwr.—7%	90	92	95
Yadkin River Pwr.—7%	f102	102	103
Holding Companies			
Amer. & Foreign Pwr.—7%	f 91½	87	94
cAmer. Elec. Pwr.	g100	96	104½
Amer. Gas & Elec.—6%—no par	89	85	91
Amer. Lt. & Trac.	100	93	101⅓
Amer. Pwr. & Lt.—6%	93	84	91½
Amer. Pub. Serv.—7%	89	88	94
Amer. Pub. Utilities—5%	78	71	82
Amer. Pub. Utilities—7%	89	87	95
Amer. Water Wks. & Elec.—6%	104	95½	110¼
Amer. Water Wks. & Elec.—7%	f 99	98	103
Assoc. Gas & El.—7%—1% extra—50	f 51	....	....
Assoc. Gas & Elec.—$6—no par	84	....	....
Carolina Pwr. & Lt.—$7—no par	104	100	107
Central Ark. Ry. & Lt.—7%	97	91	98½
Central Ind. Pwr.—7%	90	88	95
Central States Elec.—7%	97	87	98
Cities Serv.—6%	83	80	84
Columbia Gas & Elec.—7% pf.	109	104½	110½
Commonwealth Pwr.—6%	81	80	85½
Continental Gas & Elec.—7% pfd. pf.	93	85	97
Continental Gas & Elec.—7% pr. pf.	94	89	95
Elec. Bond & Share—6%	f104	104	106
Elec. Investors—7%	93	90	100
Elec. Pwr. & Lt., ctfs.	f 90½	90	94
Elec. Pwr. & Lt., ctfs. 40% pd.	f107½	100½	110¾
Galveston-Houston Elec.—6%	68	70	75
Gen. Gas & Elec.—6%	230	72	240
Gen. Gas & Elec.—7%	150	120	....
Gen. Gas & Elec.—$7—no par	150	90	175
Gen. Gas & Elec.—$8—no par	160	104½	180
Georgia Lt., Pwr. & Rys.—6%	80	74	85
Jersey Central Pwr. & Lt.—7%	97	90	96
aMiddle West Utilities—7%	98	91½	98¾
Middle West Utilities—pr. lien 7%	105	98	108
Natl. Lt., Ht. & Pwr.—5%—....	62	40	65
Natl. Pwr. & Lt.—$7—no par.	98	95	99
No. Amer.—6%—50	f 49¾	46½	50½
No. Tex. Elec.—6%	55	60	75
Penn-Ohio Elec.—7%	96	83½	96
cPhila. Co.—50	49	45	49½
Pub. Serv. Corp. of N. J.—7%	103½	99	104
Pub. Serv. Corp. of N. J.—8%	114	108½	115½
Southeastern Pwr. & Lt.—7%	97	90	100
Southern Cities Utilities—7%	84	77	100
Southwestern Pwr. & Lt.—7%	100	90	102
Standard Gas & Elec.—8%	f 55	50½	55
Standard Gas & Elec.—7%	98½	96	100
Standard Pwr. & Lt.—7%	109	95	114½
United Gas & Elec.—5%	91	80	94
cUnited Gas Improv.—50	99	79½	100
United Lt. & Pwr.—$4—no par	50	41	51
United Lt. & Pwr.—$6.50—no par	94	83	99
Western Pwr. Cor.—7%	88	84	95½
COMMON STOCKS			
Operating Companies			
Adirondack Pwr. & Lt.—50	85	31	98
Appalachian Pwr.—no par	78	70	83
Arizona Pwr.	25	15	33
Arkansas Lt. & Pwr.	100	65	101
Brooklyn Edison	f138¾	120½	140⅜
Buffalo Gen. Elec.	65	44	73¾
Cleveland Elec. Illg.	240	200	250
aCommonwealth Edison	137½	130½	141½
cConsol. Gas, Elec. Lt. & Pwr.	44½	32	45
Dayton Pwr. & Lt.	400	180	460
Detroit Edison	f131½	110	134½
Eastern Tex. Elec.	68	70	75½
dEdison Elec. Illum. of Boston	201	200	213
Georgia Ry. & Pwr.	100	62	102
aKy. Hydro.-Elec.	92½	85½	92½
Long Is. Light	105	60	105
Miss. River Pwr.	66	37	68
Montana Pwr.	f 91½	64	99½
New Orleans Pub. Serv.—no par	33	31	38½
Niagara Falls Pwr.—no par	g 61	45½	77
Niagara, Lock. & Ont. Pwr.—no par	65	60	73
North. Ohio Pwr.	10½	5	13½
North. States Pwr.	118	103	125
Pacific Gas & Elec.	f113½	102½	118½
ePenn. Wtr. & Pwr.	g185	126½	185
cPhila. Elec.—25	45	37½	47¾
Portland Elec. Pwr.	36	40	53
Pwr. Corp. of N. Y.—no par	81	15	89½
Pub. Serv. Co. of No. Ill.	118	97	124
Puget Sound Pwr. & Lt.	53	49	61
So. Calif. Edison	126	102	139
Tenn. Elec. Pwr.—no par	60	47	69
Toledo Edison	25	21	25
Utica Gas & Elec.	200	100	200
Virginia Pwr.	66	65	92
Virginia Ry. & Pwr.	g123½	64½	123½
West Penn	111	105	145
Holding Companies			
Amer. & Foreign Pwr.—no par	f 43½	27½	47
Amer. Gas & Elec.—no par	77	70	85
Amer. Lt. & Trac.	217	139	220
Amer. Pwr. & Lt.	56	52	67
Amer. Pub. Serv.	85	45	90
Amer. Public Utilities	98	70	103
Amer. Wtr. Wks. & Elec.	f 63	34¾	68½
Assoc. Gas & Elec., Class A	f 39⅜	....	....
Carolina Pwr. & Lt.—no par	390	290	430
Central States Elec.	140	70	102
Cities Service (new)	38½	34	43
Columbia Gas & Elec.—no par.	f 75½	45½	75½
Commonwealth Pwr. Corp—no par	140	106	173
Cons. Gas—no par	f 89½	74½	92⅝
Continental Gas & Elec.	135	77	99
Elec. Bond & Share Sec.	f 65	65	68
Elec. Investors	59	30	66
Elec. Pwr. & Lt., ctfs.	f 33	17⅜	40⅛
Federal Lt. & Trac.	f 29	26¾	36
Galveston-Houston Elec.—no par	20	32	40
General Gas & Elec.	220	72	240
Georgia Lt., Pwr. & Rys.	68	25	74
Jersey Central Pwr. & Lt.	45	15	50
Lehigh Pwr. Securities—no par	135	82	155
aMiddle West Utilities—no par	109	82½	125
aNational Elec. Pwr.	95½	94	96½
Natl. Lt., Ht. & Pwr.	11	11	....
Natl. Pwr. & Lt.—no par	331	185	357
North. Tex. Elec.	40	40	70
No. Amer.—10	f 59½	41½	60⅜
No. Tex. Elec.	40	40	70
Phila. Co.—50	f 59	51½	62½
Pwr. Securities—no par	15	....	....
Pub. Serv. Corp. of N. J.—no par	f 84½	62½	87½
Republic Ry. & Lt.	66	49	65
Southeastern Pwr. & Lt.	145	45	158
Southern Cities Utilities	60	30	71
Standard Gas & Elec.—no par.	f 55½	40½	59¾
United Gas & Elec. (Conn.)—no par	45½	26	49
United Lt. & Pwr.—A—no par	132	42	138
United Lt. & Pwr.—B—no par	170	49	100
Western Pwr. Corp.—no par	57	34	68
BONDS			
Operating Companies			
Adir. Pwr. & Lt.	6s 1950	104½	102½ 105½
Ala. Pwr.	5s 1946	98	96 100
Appalachian Pwr.	5s 1941	97	96 99¼
Brooklyn Edison	5s 1949	101⅛	99½ 103
	6s 1930	104¼	103½ 105½
Cleveland Elec. Illum.	5s 1939	101	100 102
Com'wealth Edison.	5s 1943	101½	99½ 102⅛
	5s 1953	98½	98½ 101
eConsol. Gas Elec. Lt. & Pwr.	4½s 1935	97	93½ 97½
	6s 1949	106	104½ 107½
Consumers' Pwr.	5s 1936	99½	99 100½
	5s 1952	96½	90½ 100
Detroit Edison	5s 1933	101½	99½ 102½
Duquesne Lt.	6s 1949	105½	104½ 107½
Great Western Pwr.	5s 1946	97¼	95 99¼
Kansas City Pwr. & Lt.	5s 1952	99	95½ 101
Miss. River Pwr.	5s 1951	98½	96½ 100½
Montana Pwr.	5s 1943	99½	97½ 100⅜
New Eng. Pwr.	5s 1951	101	100½ 103
N. Y. Edison	6½s 1941	113½	112 115½
Niagara Falls Pwr.	6s 1932	105	103½ 106½
No. States Pwr.	5s 1941	96⅜	93 99½
No. States Pwr.	6s 1941	104	103 107½
Ohio Pwr.	7s 1951	106	106½ 107½
Pacific Gas & Elec.	5s 1942	96⅜	93½ 99
ePenn. Wtr. & Pwr.	5s 1940	130	100 100½
cPhil. Elec.	5s 1966	101½	100 103½
	5½s 1947	106	103½ 107
	6s 1941	106½	106 108⅜
Portland Elec. Pwr.	6s 1947	99½	96½ 100
So. Cal. Edison	5s 1939	98	99½ 101
	6s 1944	103	102½ 105½
Tenn. Elec. Pwr.	6s 1947	102½	99½ 104½
Tex. Pwr. & Lt.	5s 1937	97½	97 99½
Toledo Edison	7s 1941	109½	108½ 110
Utah Pwr. & Lt.	5s 1944	95	91 98½
Holding Companies			
Ala. Trac. Lt. & Pwr.	5s 1962	100½	86 99½
Amer. Gas & Elec.	6s 2014	97	96½ 98½
Amer. Pwr. & Lt.	6s 2016	95½	94 98
Am. Wtr. Wks. & Elec.	5s 1934	95½	92½ 98
Assoc. Gas & Elec.	6½s 1954	f103¾	....
Central Ind. Pwr.	6s 1947	97	95½ 99½
Commonwealth Pwr.	6s 1947	102½	97½ 103½
Consol. Cities Lt., Pwr. & Tr.	5s 1962	79½	75½ 82½
Ill. Pwr. & Lt.	6s 1953	100½	100½ 102½
United Lt. & Rys.	5s 1932	94½	93½ 97½
	6s 1952	97½	95½ 100½
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Mfg.		106½	103½ 108
aNational Carbon		g 126	120 130
bWagner Elec.		81½	79 91
West. Elec. Instrument—A		f 25½	19½ 26½
Western Elec.—7%		f 111	110 117½
Worthington Pump & Mach.—A		74½	77 88
Worthington Pump & Mach.—B		61	58 76½
COMMON STOCKS			
Allis-Chalmers Mfg.		f 86½	71½ 88⅞
Amer. Bosch Magneto—no par		f 32	26½ 54½
Elec. Storage Battery—no par		f 64½	60½ 70
General Elec.		f336	227½ 337½
General Elec.—10		f 11½	11 11½
aHurley Machine—no par		51	41½ 56
Timken Roller Bearing		f 42	37½ 46½
bWagner Elec.		34½	26½ 50
Westghse. Elec. & Mfg.—50		f 78½	66½ 84
West. Elec. Instrument		f 19½	9½ 20½
Worthington Pump & Mach.		f 39½	35½ 79½
BONDS			
General Elec.	3½s 1942	87	83 87
	5s 1952	107⅜	101½ 107⅜
Robbins & Myers.	7s 1952	60	61½ 73½
bWagner Elec. Mfg.	7s	g 100½	100 102
Western Elec.	5s 1944	101	98 101
Westghse. Elec. & Mfg.	7s 1931	106½	103½ 108½

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore. fBid price, low and high, Tuesday, Aug. 25. gLatest quotations available.